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Linden et al

Serial No. 07/913,227

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For: Intra-Extravascular Drug Delivery Catheter and Method

SUBMISSION

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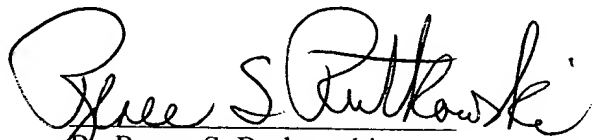
Dear Sir:

At the request of William D. Hathaway, of Westman, Champlin and Kelly, of Minneapolis, Minnesota, submitted herewith is a portion of the file history of the application noted above, as requested by Patent Examiner Cris L. Rodriguez.

The Notice of Allowability of April 1, 1994 is flagged with a yellow tag, for convenience of Ms. Rodriguez.

Should there be any questions, kindly contact Mr. Hathaway at (612)334-3222.

Linden et al

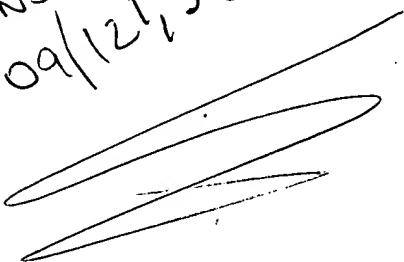


By Renee S. Rutkowski

Reg. No. 30,321

April 22, 2002

DEWNGS
IN 09/121,368



APR 22 2002

Case No. 3570/216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE:

INTRA-EXTRAVASCULAR DRUG
DELIVERY CATHETER AND
METHOD

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INTRA-EXTRAVASCULAR DRUG
DELIVERY CATHETER AND METHOD

BACKGROUND OF THE INVENTION

The present invention relates to a drug delivery device and method for delivering a drug agent to a vessel or vessel-like lumen in the body. More particularly, the present invention relates to a drug delivery device and method wherein the drug agent is delivered to the vessel wall or to the outside of the vessel wall.

Obstructive atherosclerotic disease is a serious health problem facing our society today. This disease is the result of the deposit of fatty substances and cells and connective tissue on the interior of the walls of the arteries. The build-up or accumulation of such deposits results in a narrowing of the inside diameter of the artery which in turn restricts the blood flow through the artery. This disease, wherein the opening or lumen of the artery is narrowed, is known as atherosclerosis and the accumulation is known as a lesion.

One commonly used procedure for treating an obstruction caused by atherosclerosis is a procedure known as coronary artery bypass graft surgery ("bypass surgery"). Although bypass surgery has been used with moderate success in the treatment of atherosclerosis, it can be invasive and traumatic to the patient.

One less invasive and traumatic procedure developed more recently is coronary angioplasty. Coronary angioplasty, and angioplasty in general, is a procedure in which a balloon is positioned in the inside

of the artery at the site of the accumulation or lesion and inflated in order to dilate the atherosclerotic lesion and thus open the restricted area of the artery. In order to advance the balloon to the lesion, the balloon is attached to the distal end of a small diameter catheter, which includes means for inflating the balloon from the other end of the catheter. The catheter is maneuvered or "steered" through the patient's vessels to the site of the lesion with the balloon in an un-inflated form. When the un-inflated balloon is properly positioned at the lesion, the balloon is then inflated to dilate the restricted area.

While angioplasty has been relatively successful in treating coronary artery disease, restenosis of the treated site often occurs approximately 3 to 6 months following the procedure. It is believed that the primary factor in developing restenosis is the healing that takes place after the injury caused by the intervention of balloon dilation procedure. The restenosis has close analogy to scar formation following vascular surgery in that the histologic result has a similar morphology. The histologic response is called myointimal hyperplasia. The process of myointimal hyperplasia consists of the migration of smooth muscle cells through the internal elastic lamina into the vessel lumen where they then proliferate. The net result is a thickening of the vessel wall. Over time, this thickening reoccludes or restenoses the vessel to a point where it is clinically significant. That is, the blood flow through the vessel is diminished to a rate similar to the rate before the angioplasty procedure. The occurrence of this seems to happen approximately 30-35% of the time following an angioplasty to that specific site in coronary arteries.

Several alternative procedures have been attempted to try to affect the occurrence or rate of the restenosis following intervention to the lesion site in

the coronary artery. These procedures have included the use of lasers, mechanical atherectomy devices, heated balloons, and metal implantable stents. While each of these procedures has shown some success in dealing with the initial lesion, all have the similar problem of restenosis at a similar or even greater occurrence. Current estimates of restenosis of the lesion site using these alternative procedures ranges between 40-50%. The time frame of restenosis of all of these is generally from 3-6 months after the procedure.

Therefore, it appears that this restenotic healing lesion area is independent of the type of interventional procedure used. Rather, it is a physiologic response to any type of injury brought to that lesion site. Because of this intervention independent physiologic response, it is felt by many physicians that potentially the best way to deal with restenosis would be by a pharmacologic means, such as a drug agent, targeted at the biochemical events that take place after injury.

To date, most pharmacologic trials involve either an oral or intravenously injected drug that is delivered throughout the whole body in hopes of trying to effect this small site in the arteries. This type of pharmacologic treatment is known as a "systemic treatment." Some agents that have been tried in human clinicals include: heparin, calcium channel blockers, angiotensin converting enzyme inhibitors, Omega-3 fatty acids, and growth peptides. Other agents that may not have been tried in clinicals but are of interest include thromboxane synthetase inhibitor, serotonin, growth factor inhibitors, growth factor analogs such as angiopeptin, antagonists, HMGCoA reductase inhibitors, platelet derived growth factor, inflammatory cell factors, platelet aggregation inhibitors, and thrombin inhibitors such as hirudin or its analogs.

The indication for use of most of these has been either in vitro-cell culture studies or animal studies. These studies have shown some effect on the smooth muscle cell proliferation and migration which are major components of the myointimal hyperplasia that takes place in the restenotic lesion. However, none of the systemic drug delivery human trials to date has shown a major effect on the occurrence of restenosis.

Even though none of these agents have been completely successful in the in-vivo human clinical trials, it is still generally felt that one of these agents or some other new agent, if delivered locally and site specifically to the lesion, would still be able to reduce the proliferative response. One of the problems with systemic techniques is the inability to deliver a high enough concentration of the agent locally at the lesion in order to effect the physiologic response. In the in-vitro and in-vivo animal studies which have shown some success, a high concentration of the agent was used. Thus, it is believed that if the agent was delivered specifically to the site as opposed to systemically, the agent may be delivered at a high enough concentration to truly effect the physiologic response.

The reason many of these agents have not been used in a higher concentration in-vivo in humans is that many of the agents may exhibit undesirable side effects. Thus, if a high concentration of the agents is given systemically, they may have unwanted physiologic effects. Therefore, if the drug can be given with high concentrations locally to the vessel wall while minimizing the systemic amount of drug, the desired result of modulating the restenotic growth while preventing any unwanted systemic effects may be achieved.

There are other ways known to date in trying to create a site specific local delivery of drug to a site. One approach presently contemplated is the use of a

perforated or sweating balloon. For example, a drug delivery device is disclosed by Wolinsky, H., et al. in the article entitled, Use of a Perforated Balloon Catheter to Deliver Concentrated Heparin Into the Wall of a Normal Canine Artery, 15 JACC 475 (Feb. 1990). This device is a percutaneous transluminal coronary angioplasty (PTCA) balloon with several microholes in the balloon for delivery of an agent during balloon dilatation. The drug is incorporated into the same fluid which is used to inflate the balloon.

A disadvantage of available devices, such as the one disclosed by Wolinsky et al., is that these devices cause a substantial blockage of blood flow in the subject vessel during the procedure. Thus, such devices may only be used for the fairly short time frame (typically, from one to two minutes), similar to the time frame of the actual angioplasty dilatation.

Other available drug delivery devices are disclosed, for example, in United States Patent Numbers 4,824,436 (Wolinsky) and 4,636,195 (Wolinsky). These devices are directed to a dual occlusion catheter in which a balloon is inflated proximally and distally of the accumulation or lesion creating a space for infusion of a drug. This dual balloon catheter creates a space for infusion of drug separate from the blood flow. This device, however, also can only be used for a short period of time because it occludes blood flow.

In these types of devices where a balloon is inflated inside the vessel, some means for providing perfusion through the catheter itself becomes important. It is necessary in such devices that the device provide a large latitude in time over which the agent could be delivered. Devices which occlude blood flow may not provide the necessary latitude. Because the basic research into the biochemistry and physiologic events indicate that the initial events begin immediately after

injury and continue intensely for several hours, it is desirable for the drug delivery system to allow drug delivery for several hours to a day or two beginning immediately after intervention. This research also points out that the initial events subsequently create a cascade of events that ultimately lead to intimal thickening. While these accumulations or lesions do not become apparent for several months, it is felt that if these initial events can be modulated, blocked, or even accelerated, then the subsequent cascade can be altered and a diminished overall thickening could be achieved.

Some devices have been designed which permit localized delivery of a drug agent while providing enhanced perfusion capabilities. For example, the drug delivery catheter disclosed in co-pending U.S. Patent Application Serial No. 07/740,045 filed on August 2, 1991, commonly assigned to the Assignee of the present application, provides an inflatable perfusion lumen which provides significantly more perfusion area than previous drug delivery devices. The disclosed catheter and method also provides drug delivery pockets on the outer periphery of the perfusion lumen. The pockets allow the drug agent to be delivered site specifically for extended periods of time.

All of the drug delivery devices discussed above, however, require that the device remain in the vessel while the drug agent is being administered. It would be desirable to have a technique for delivering a drug agent locally without the need for the drug delivery device to remain in the vessel.

To this end, some techniques have been proposed wherein a drug is delivered by a surgical procedure where a drug agent is delivered to the outside of a vessel to be treated. Studies have shown that during administration by implanting a controlled release device which surrounds the vessel (periarterial drug

administration) using drugs such as heparin-ethylenevinyl acetate significantly inhibited restenosis in an arterial injury model. See for example, Edelman et al., Proc. Natl. Acad. Sci. U.S.A., 87, 3773 (1990); and Edelman et al., J. Clin. Invest., 39, 65 (1992). In these types of procedures, access to the vessel is obtained by surgically cutting to the desired location in the vessel. Then the drug agent is maintained at the desired location by wrapping a band or cuff around the vessel with the agent being loaded into the band or cuff. Although periarterial drug administration has shown some initial success in an animal model, this procedure used for delivering the implant has the obvious disadvantage of being very invasive.

Therefore, it is desirable to have a drug delivery device capable of providing the necessary blood flow to the heart while the drug agent is being administered, which can be removed after the drug agent has been delivered and which is substantially less invasive than presently proposed techniques.

Such a device may also be extremely desirable in other procedures where a drug is to be delivered to a specific site in a vessel. For example, drug delivery devices may be useful in procedures where a drug or agent is used to dissolve the stenosis in an effort to avoid the use of angioplasty or atherectomy procedures altogether or to deliver a thrombolytic agent to dissolve a clot at the lesion site. Such a device may also be useful in the treatment of various disorders involving other vessels or vessel-like lumens in the body.

It will be recognized from this discussion that there is a need for a generic type of drug delivery system which emphasizes physician control over the device and agent. The device should have flexibility as to the agent that is to be delivered and should be capable of delivering any number of agents (either separately or at

the same time), or possibly also allow a change in the protocol of the delivery. It should also be flexible with respect to the time frame over which these agents would be delivered. It would also be desirable to have a device which can be removed from the vessel while the drug remains in place at the desired location.

Therefore, it is a primary object of the present invention to provide a device and method which can contain a relatively high concentration of a drug agent in a selected portion of a vessel, such as a blood vessel.

It is another object of the present invention to provide a device which can be removed after the agent has been delivered while the drug remains at the desired site.

It is a still further object of this invention to provide a device which is flexible as to the drug and the number of drugs or combination of therapeutic agents which can be delivered as well as the time frame over which they can be delivered.

SUMMARY OF THE INVENTION

To achieve these and other objects, the present invention provides a new and unique drug delivery catheter and method which may be inserted into a vessel, such as a blood vessel. The drug delivery technique of the present invention includes a catheter which comprises an elongated tubular shaft with an inner lumen and a vessel puncturing element which is housed in the lumen. The puncturing element has a retracted position such that it will not be in contact with the vessel wall as the catheter is guided through the vasculature. The puncturing element also has a puncturing position where it protrudes outwardly of the catheter shaft and engages and punctures the vessel wall.

First, the catheter is inserted into the area to be treated. The puncturing element is then moved to its puncturing position and the inner surface of the vessel wall is punctured. A drug agent is then delivered through the puncture in the wall. The drug agent may be delivered either into the vessel wall itself or outside of the vessel wall. Thus, the drug will remain at a treatment site and diffuse, preferably in a time released manner to the treatment area. The drug will remain at the delivered site even after the drug delivery catheter has been removed from the vessel.

In a preferred embodiment, the puncturing element comprises a needle which also functions as a tube to deliver the drug.

In a preferred embodiment, the techniques of the present invention involves the implantation of a biodegradable material loaded with the drug agent in close proximity to the extravascular side of the vessel where the implant will remain and release the drug agent over a period of time.

The present invention provides a device and method for drug delivery in relatively high concentrations and which can be used in a relatively flexible time frame depending on the particular form of the drug being delivered.

Additional objects, advantages and novel features of the invention will be set forth in part in the description which follows and in part will become apparent to those skilled in the art upon examination of the following or may be learn by practice of the invention. The objects and advantages of the invention may be obtained by means of the combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 shows side sectional view of an embodiment of the drug delivery catheter of the present invention.

FIGURE 2 shows an enlarged sectional view of the embodiment of FIGURE 1.

FIGURE 3 shows an enlarged section view of the embodiment of FIGURE 1 puncturing a vessel.

FIGURE 4 shows a cross-section of drug delivery catheter taken along line 4-4 of Figure 6.

FIGURE 5 shows a cross-section of the drug delivery catheter taken along line 5-5 of Figure 6.

FIGURE 6 shows an enlarged view of the puncturing area of the catheter of Figure 1.

FIGURE 7 shows a perspective view of a cam arrangement for the drug delivery catheter of the present invention taken along lines 7-7 of Figure 8.

FIGURE 8 shows a side sectional view of a cam arrangement for the drug delivery catheter of the present invention.

FIGURE 9 shows a side view of another embodiment of the drug delivery catheter of the present invention with an inflatable balloon.

FIGURE 10 shows a cross-section of the embodiment of FIGURE 9 along line 10-10.

FIGURE 11 shows an opening gauge for the catheter of the present invention.

FIGURE 12 shows another embodiment of the present invention with the puncturing element in the retracted position.

FIGURE 13 shows the catheter of the embodiment shown in FIGURE 12 with the puncturing element in the puncturing position.

FIGURE 14 shows another embodiment of the present invention with the puncturing element in the puncturing position.

FIGURE 15 shows another embodiment of a cam arrangement for the present invention.

FIGURE 16 shows an embodiment of a manifold which can be used with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now specifically to Figures 1-5, a preferred embodiment of the drug delivery catheter 20 of the present invention is illustrated. The drug delivery catheter comprises a tubular catheter shaft 21 which has a proximal end, connected to a manifold 32, and a distal end. The distal end of the catheter 20 is intended to be inserted into and placed at the treatment site in the vessel 23. The catheter shaft may be made of any suitable material such as a metallic tube (commonly known in the art as a hypotube), a polymer material, or polypropylene. An exemplary dimension for the shaft is a 4F (≈ 0.053 ") but for coronary applications a size of 8F or smaller will be suitable. An exemplary length for the catheter shaft 21 is 51" but for coronary applications lengths from 15" to 60" are suitable.

Referring to Figure 4, the catheter shaft 21 includes a first lumen 24 and a second lumen 26. The first lumen 24 is used to house and guide the vessel puncturing element of the drug delivery catheter 20. The second lumen 26 is used to house a guidewire or fixed wire 28 in order to advance the catheter to the desired location in a manner known in the art. In an exemplary embodiment, the first lumen 24 is "D" shaped and has a height h_{L1} of about 0.022" and a width W_{L1} of about 0.042"

and the second lumen 26 has a height h_{L2} of about 0.016" and a width W_{L2} of about 0.023".

In the illustrated embodiment, the vessel puncturing device comprises a needle 22 which is bent at its distal end to define a short U-shaped portion. The bent tip 22a of the needle 22 defines the puncturing element. The needle defines a tube through which the drug agent may be delivered. Thus, with this preferred embodiment, the needle 22 functions as both the puncturing element as well as the drug delivery means. Preferably, the needle 22 is joined to a thicker tube 25 which may be bonded to another slightly larger tube. In an exemplary embodiment the needle 22 is a sharpened hypotube with an OD of 0.008" and an ID of 0.004". The needle 22 is bonded using cyanoacrylate to a polyamide tube 25 with an OD of 0.018" and an ID of 0.016" and a length of about 10". The tube 25 is in turn bonded using cyanoacrylate to a hypotube having an OD of 0.014" and an ID of 0.007" and a length of about 3.5'.

The needle 22 is comprised of a material which will provide a certain degree of opening force when the tip 22a is bent towards a position parallel with the catheter shaft 21. The amount of opening force will also depend on the angle ϕ of the bend and the length L of the tip 22a. In an exemplary embodiment, the needle 22 is a stainless steel hypotube with an angle ϕ in the completely opened or relaxed position being about 30° and the length L of the tip 22a being about 6mm. Suitable materials for the needle or hypotube include spring steel, stainless steel, titanium, nitenol, a polymer or copolymer or some combination of these materials. The ID of the needle 22 may vary from less than 0.001" to about 0.131" and have OD from smaller than 35 gauge to about 6 gauge. Exemplary OD's for the needle 22 for coronary applications are from 30 to 36 gauge.

As illustrated in Figure 6, the point of the tip 22a is preferably beveled at an angle θ for varied cutting effects. In an exemplary embodiment, the angle θ is about 25°. Patterns may also be formed on the sharpened end of the needle tip 22a to optimize its cutting or puncturing properties.

It will also be recognized that the lumen of the needle 22 may have various shapes. In an exemplary embodiment, the shape of the needle lumen is round, but the needle lumen may also be oval, rhomboid, trapezoidal, triangular, or rectangular.

Although only a single needle is illustrated in this embodiment, the drug delivery catheter 20 may comprise a multitude of needles.

Manifold 32 comprises an external body which has a port communicating with the guidewire lumen 26 for the introduction of the guidewire 28 through the catheter 20. The manifold 32 also includes an actuator which communicates with the needle 22 in such a way that a fluid can be delivered through the lumen in the needle 22. The actuator may comprise for example a syringe 33 which may be used to infuse the fluid into the needle 22. A suitable syringe is a standard luer lock 5cc syringe available from Becton Dickinson. The infusion may also be accomplished by other methods such as an infusion pump or gravity.

Referring to Figure 16, a manifold 32 includes the actuating element. The manifold 32 includes a manifold body 50 with grooves 51. A mating member 58 includes ribs 52 which slide into the grooves 51. The needle 22 (not shown in Figure 16) is bonded to the end 54 of the member 58. A lock 56 formed of members 56a and 56b bonded together locks the body 50 to the engaging member 58 as the lock 56 is rotated. Thus, the needle 22 will move as the member 58 is moved and then is locked in the desired position.

As illustrated best in Figures 3 and 6, the catheter shaft 22 includes a window 30 near its distal end. When the distal tip 22a of the needle 22 is positioned such that it is distal of the distal portion of the window 30 (Figure 2), the needle tip 22a is bent and housed completely within the catheter shaft 21 thus defining a retracted position for the puncturing element. As the needle 22 is pulled in a direction toward the proximal end of the catheter 20, the tip 22a of the needle 22 will begin to protrude radially outwardly and outside the perimeter of the catheter shaft 21 through the window 30. As the tip of the needle tip 22a protrudes outwardly, it will move until it engages the inner surface of the vessel wall 23. Upon further movement of the proximal end of the needle 22 in the proximal direction, the needle tip 22a will puncture the vessel wall 23 as illustrated in Figure 3.

As illustrated in Figures 2, 3 and 6, of the present invention may also include a trolley which is used to guide the needle 22 back into the window 30 when the needle 22 is advanced forward to move the needle 22 to its retracted position. In the illustrated embodiment, the trolley includes a wire loop 34 which surrounds the needle 22 and a plug 36 to which the wire loop 34 is attached. The plug 36 may be, for example, tubing filled with an adhesive. The wire loop 34 may be attached to the plug 36 by bonding or any other suitable method. The plug 36 and loop 34 can move freely in the axial direction in the inner lumen 24 of the catheter shaft 21. The plug 36 may also serve as a cam to inhibit rotation of the needle 22.

The location of the window 30 will be determined by the specific use contemplated for the device. In an exemplary embodiment used for coronary applications, the window 30 will be 3mm long and disposed about 20mm from the distal tip of the catheter 20. It

will be recognized, of course, that the window size and location may vary for other applications such as peripheral applications.

As illustrated in Figures 7 and 8, the catheter 20 of the present invention may also include a plurality of cams 38 which act as anti-rotation means for the needle 22. The cams 38 may be bonded, to the hypotube and spaced at suitable distances, for example (distance) apart. A suitable bond for the cams is cyanoacrylate. In the illustrated embodiment, the cams 38 are D-shaped and have a width of approximately 0.418", a height of approximately 0.223", a length of approximately 0.844" and an inner aperture for the hypotube needle 22 having a diameter of approximately 0.019". These cams 38 may be made of a material such as platinum or PTFE or a combination of a polymer and metals. With such materials, the cams 38 may aid in the visualization of the movement of the needle tip 22a on a fluoroscope.

It will be recognized by those skilled in the art that other suitable anti-rotation means may be employed. For example, the needle 22 and lumen 24 may be provided with mating gears. Figure 15 illustrates an embodiment where a gear 60 is bonded to the needle 22 and a mating gear 62 is formed in the tube 61.

It will also be possible to coat the inner diameter and outer diameter of the various tubes with materials such as teflon, silicone, or HPC to reduce friction between the sliding elements.

Referring now to Figure 11, the catheter of the present device may also include an opening gauge which is comprised of a plurality of markers 64 disposed on the hypotube 22 and a marker 66 on the catheter shaft 21. These markers may be made of a material such as platinum and bonded to the respective tubes. In this manner, the markers may be used to gauge the degree to which the tip 22a of the needle has opened and penetrated the vessel.

It will be recognized that the plurality of markers may be disposed on the catheter shaft 21 and a single marker on the needle 22.

Figures 9 and 10 illustrate another preferred embodiment of the invention which includes an inflatable balloon 38. The balloon 38 is used to enable controlled placement/penetration of the needle 22. The balloon 38 is placed distally of the window 30 in the illustrated embodiment. It will be recognized, of course, that the balloon 38 may also be placed proximal of the window 30. This balloon 38 will stabilize or hold the shaft 21 at the desired position in the vessel as the needle 22 is retracted and opened to its puncturing position. The balloon 38 may also serve as a means for inducing hemostasis in the site of the puncture or it may be used for dilatation before, during, or after the delivery of the drug. It will be recognized that the balloon 38 may also be used to perform PTCA or similar procedures.

For the embodiment illustrated in Figures 9 and 10 which comprises the balloon 38, a third lumen is provided for inflating the balloon 38. Figure 10 shows a cross-section of the catheter shaft which includes lumens 40, 42, and 44. These lumens 40, 42 and 44 may be used for a guide wire lumen, a lumen for the needle 22, and an inflation lumen for the balloon 38, respectively.

It is also possible that the device may be coated with a material which will make the needle 20 detectable or enhance its detectability by intravascular ultrasound. The location of the components of the delivery apparatus can then be determined with respect to one another via the use of a separate intravascular ultrasound probe, or a probe which is a component of the device itself. This will allow the physician to monitor the position of the needle as it enters its target site. It will also be recognized that the device may be coated with a material which will enable or enhance its

visualization by methods such as MRI, CT scanning, X-Ray, Gamma camera imaging, or PET scanning.

The drug delivery catheter 20 of the present invention is used to deliver drugs to the desired treatment site as follows. The catheter 20 is guided to the site which is to be treated under fluoroscopy using standard PTCA guiding catheter and guidewire techniques. The catheter 20 is advanced such that the window 30 is placed at the particular site where the drug is to be delivered. The hypotube 22 is then pulled back such that the needle tip 22a exits radially outward from the window 30 and is inserted into the vessel wall 23. The needle tip 22a is then moved further radially outward until the tip 22a is at the desired location. The needle may be positioned to deliver the drug: between the inner and out surfaces of the vessel wall 23; to the adventitial side or outer surface of the vessel wall 23; or between the tissue 27 surrounding the vessel wall 23 and the outer surface of the vessel wall 23. The drug agent is then infused into the desired location using the syringe 33 attached to the manifold 32. Since the catheter does not block the flow of blood, the infusion may take place over almost any desired period of time. After the infusion is complete, the hypotube 22 is pushed forward to remove the needle tip 22a from the vessel wall 23 and to place the needle tip 22a into place within the distal tip of the catheter 20 parallel to the catheter shaft 21.

The illustrated embodiments uses a needle which is in a retrograde position. Since the needle is angled in this retrograde path, it is protected from being filled with flowing blood and causing dissection, and allowing the track to clot. It will, however, be recognized by those skilled in the art that other positions are possible. For example, the needle may protrude directly radially outward or may even project in

a forward direction toward the distal end of the catheter 20.

Figures 12 and 13 show another embodiment of the drug delivery catheter of the present invention. In this embodiment, the needle 72 is moved to the puncturing position to puncture the wall of the vessel 78 (shown in Figure 13) by means of an inflatable balloon 76. Inflation fluid is provided through an inflation port 74. When the window 70 has been positioned at the desired location, the balloon is inflated until the needle has puncture the wall.

Figure 14 shows another embodiment where the needle 72 is moved by means of fluid pressure being applied to a flexible flap 82 through a port 80. The drug being administered itself may take various forms. For example, the drug may be delivered in the form of a polymeric rod or spike loaded with a drug which will be implanted next to the area which is to be treated. In this form, the rod or spike would be preloaded into the tip 22a of the needle 20 and would be ejected from the needle 20 as fluid pressure is applied by means of the syringe 38 to the other end of the needle 20. The catheter 20 may also be used to inject microcapsules loaded with the drug which will be placed in close proximity to the area to be treated. The catheter may also be used to deliver an emulsion of liposomes loaded with the drug which will be placed in close proximity of the area to be treated.

In these embodiments where the drug is encapsulated or loaded in a biodegradable material, the implants will remain and release the drug agent over a selected period of time after the catheter has been removed from the vessel. The device, however, can also be used to deliver the drugs in fluid for in high concentration between the outer wall of the vessel being treated and fatty tissue which surrounds the vessel. A

list of potential drugs which may be used with the present invention is provided below in Table 1.

TABLE 1

A Thrombolytic	A fragment of a glycoprotein
An Anti-thrombotic	A recombinant glycoprotein
An Anti-proliferative	A fragment of a recombinant glycoprotein
An Anti-platelet	A Carbohydrate or a fragment thereof
A Protein	An Antiarrhythmic
A Peptide	A beta blocker
A fragment of a recombinant peptide/protein	A calcium channel blocker
A fragment of a non-recombinant peptide/protein	A vasodilator
Genetic material	A vasoconstrictor
A recombinant peptide/protein	An inorganic ion or mixture thereof
A glycoprotein	

Other steps may be used to further enhance the treatment provided by the present invention. For example, the needle can be heated or cooled to enhance the performance of the device. The catheter can be used to deliver and activate hot or cold activated drugs.

The needle can also be made to vibrate at various frequencies to enhance the performance of the device (i.e. to optimize drug delivery). For example, the catheter can be used to deliver and activate sonically activated drugs.

It is also conceivable that the device may have a conduction path for the conduction, transfer or passage of light such that the device will deliver a predetermined wave length of light to a specific portion of the vessel or body cavity, the vessel wall, or to a specific portion of the adventitia. The light may then

be used to deliver and activate light-activated drugs. The catheter can be used to deliver a substance which will carry the energy of light through wave lengths and/or energy transitions or which will deliver a substance which will carry energy through wave lengths and/or energy transitions.

The device can also have selectively or non-selectively magnetized elements or can be used to induce an electric charge or induce a magnetic field in a selected area. The device can then be used to deliver and activate electrically-activated drugs.

Other uses for the catheter of the present invention are the delivery of a matrix to the exterior of a body lumen or cavity to structurally reinforce the area. A drug may be impregnated in this matrix and delivered coincidentally. The device may also be used to deliver a material that can be hardened in the wall or on the adventitial side. The hardened material may be used to form an extravascular stent or an intravascular stent depending on the precise delivery location.

The device may also be used to remove substances by using a vacuum in the needle lumen (microsuction).

Therefore, the device of the present invention provides a new and novel apparatus and technique which can be used to deliver drugs or other materials in close proximity to the extravascular side of a vessel. In addition to providing treatment for coronary disease, the present invention may be used to treat other disorders involving lumens or lumen-like vessels in the body such as prostatitis, the delivery of cancer chemotherapeutics, and the site specific delivery of controlled release antibiotics for the treatment of pericarditis, myocarditis, or endocarditis.

The present invention may also be used for delivering agents to the myocardium which have

cardioprotective effects on myocardium exposed to a global or sub-global ischemic insult i.e. induced cardiologia during an "open heart" operation in which it is necessary to stop the heart and put the patient on cardiopulmonary bypass. Possible agents to be delivered include heat-shock proteins, hormones, ATP and its biochemical precursors, glucose or other metabolic carbohydrates. The treatment can allow the heart to recover function quicker after reperfusion by reducing the "myocardial stunning" that occurs due to global ischemia.

The foregoing description of the preferred embodiments of the present invention has been presented for purposes of illustration and description. The disclosed embodiments are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teachings. It is intended that the scope of the invention be defined by the following claims, including all equivalent.

WE CLAIM:

1. A method of treating a vessel having a vessel wall with an inner surface, the method comprising the steps of:

inserting a catheter having a vessel puncturing element disposed therein into the vessel;

positioning the puncturing element at the site in the vessel to be treated;

puncturing the vessel wall at the site to be treated with the puncturing element; and

delivering a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall.

2. The method of claim 1 wherein the step of delivering the drug comprises delivering the drug into the vessel wall.

3. The method of claim 1 wherein the step of delivering the drug comprises delivering the drug to the outer surface of the vessel wall.

4. The method of claim 1 wherein the step of delivering the drug comprises delivery of the drug into tissue surrounding the vessel wall.

5. The method of claim 1 wherein the step of delivering the drug comprises the step of delivering a drug in a time release module.

6. The method of claim 1 wherein the puncturing element includes an drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

7. An drug delivery catheter comprising:
an elongated catheter shaft adapted to be
inserted into a vessel having wall, the catheter shaft
having an inner lumen and a window;

a puncturing element housed in the inner lumen
near the distal end of the shaft, the puncturing element
having a retracted position and a puncturing position;

means for moving the puncturing element from
the retracted position to the puncturing position,
whereby the puncturing element extends such that it does
not engage the vessel wall when in the retracted position
and extends outwardly of the catheter shaft to engage and
puncture the vessel wall when in the puncturing position;

a tube for delivering a drug to the puncture in
the vessel wall.

ABSTRACT OF THE DISCLOSURE

A drug delivery catheter is provided which includes a catheter comprised of an elongated tubular shaft with an inner lumen and a vessel puncturing element which is housed in the lumen. The puncturing element has a retracted position such that it will not be in contact with the vessel wall as the catheter is guided through the vasculature. The puncturing element also has a puncturing position where it protrudes radially outward of the catheter shaft and engages and punctures the vessel wall. The catheter is first inserted into the vessel to be treated and the puncturing element is positioned at the site in the vessel to be treated. The puncturing element is then moved to its puncturing position and the inner surface of the vessel wall is punctured. A drug is then delivered through the puncture. The drug may be delivered into either the vessel wall itself or to the outside of the vessel wall.

c:\gs\3570.pat\pdn

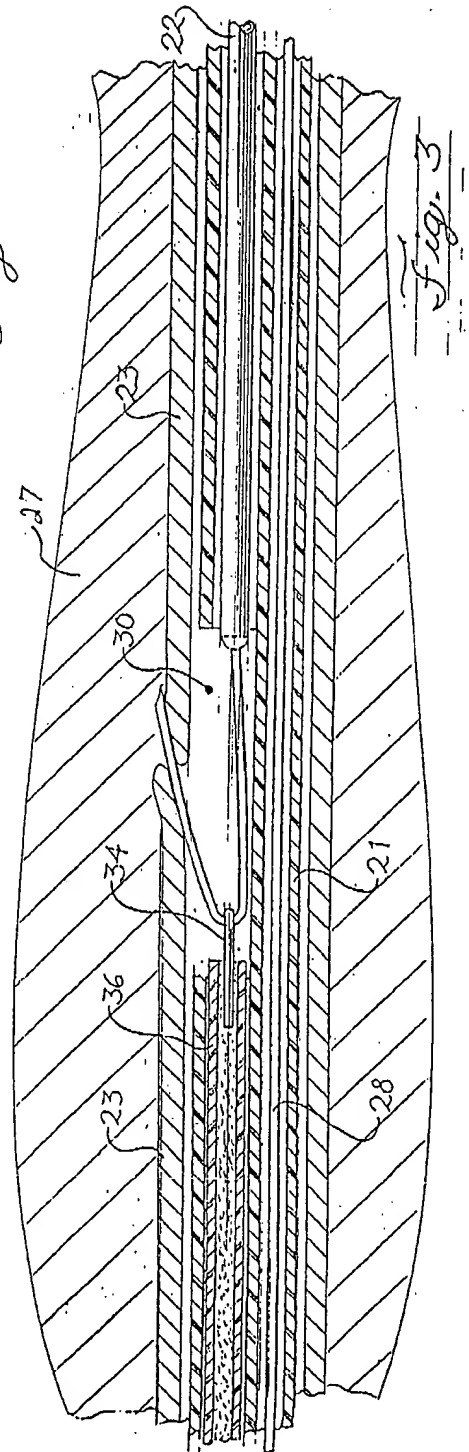
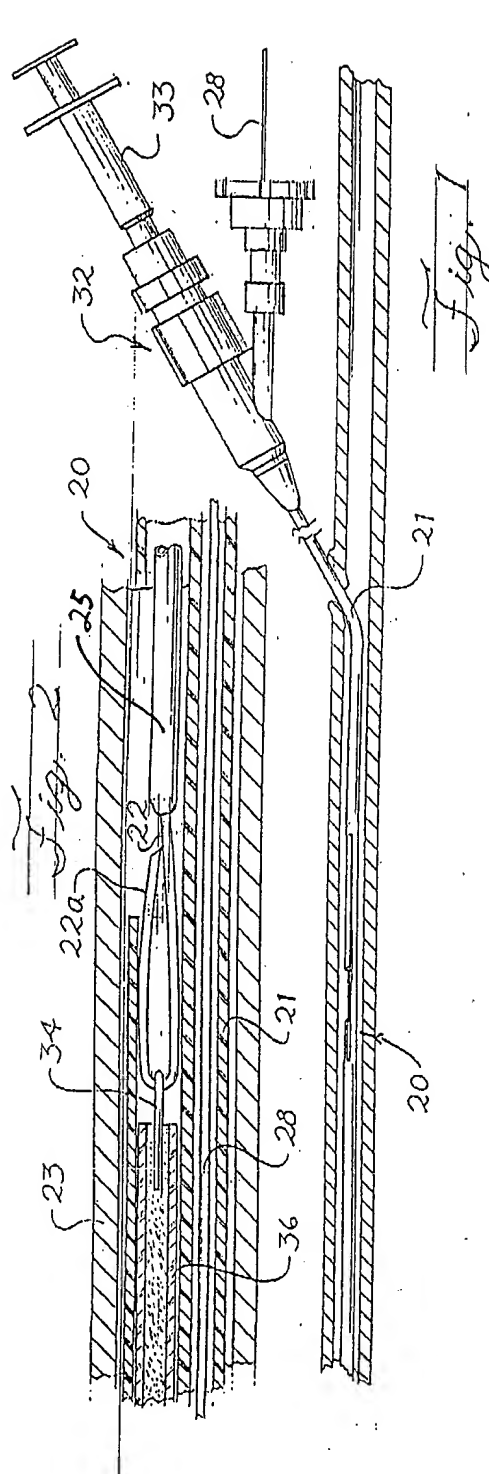


Fig. 4

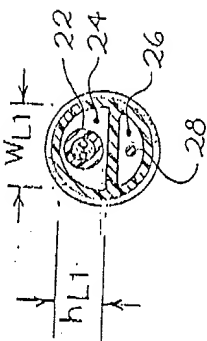


Fig. 5

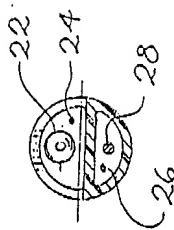
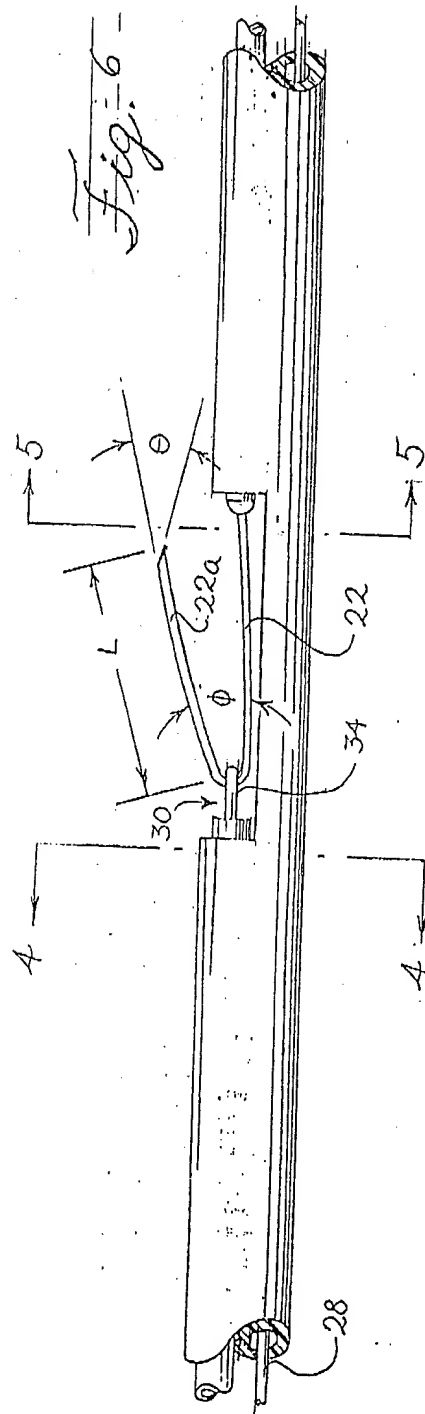
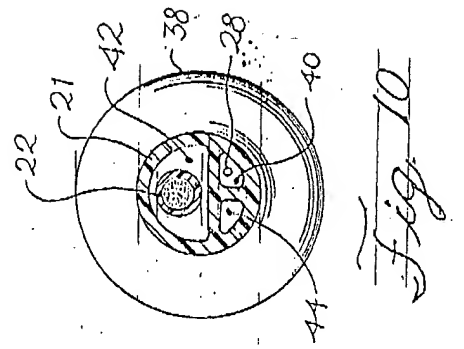
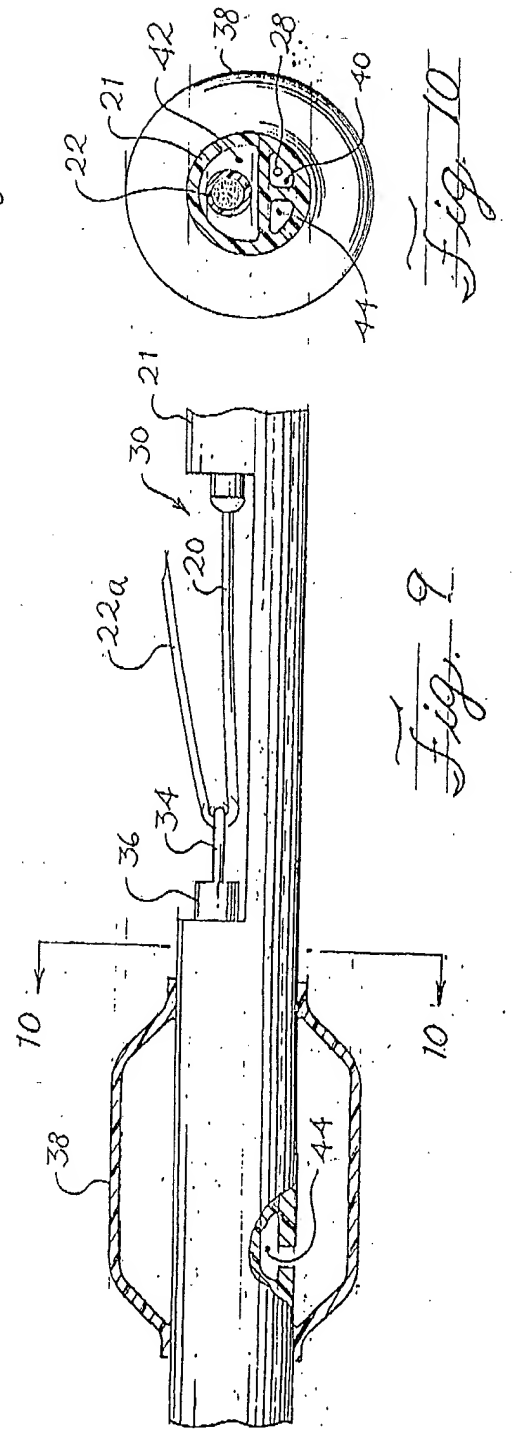
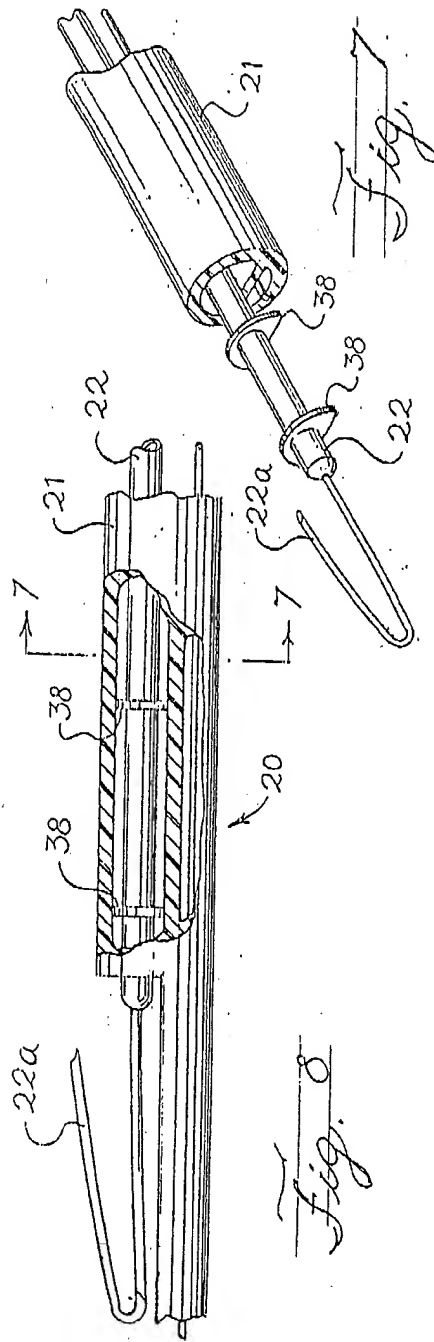
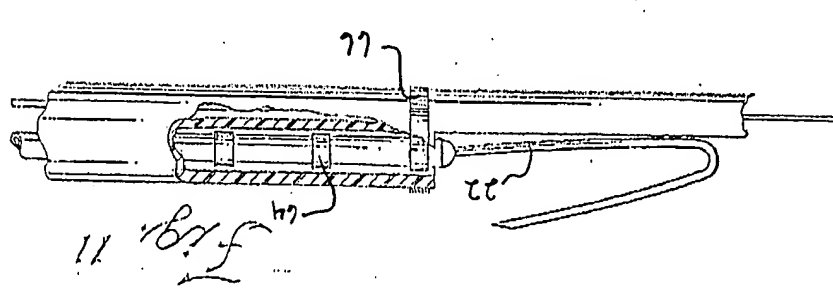
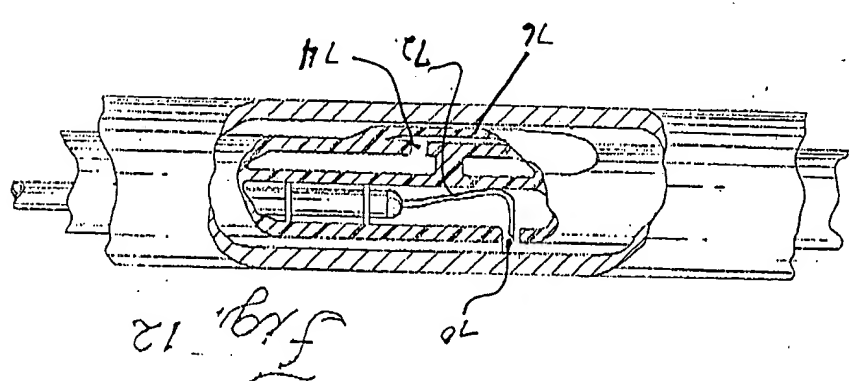
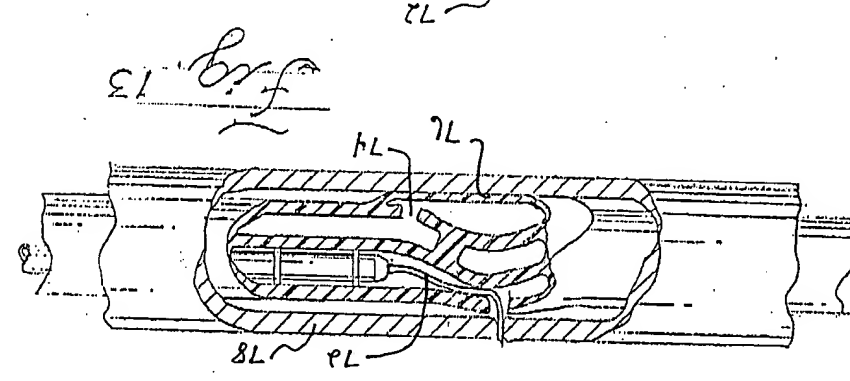
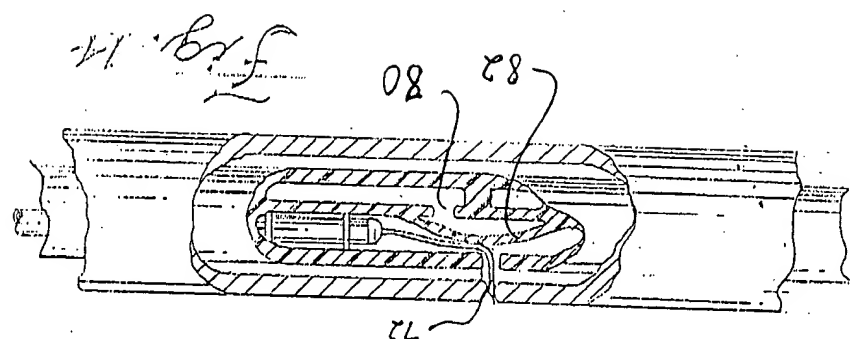
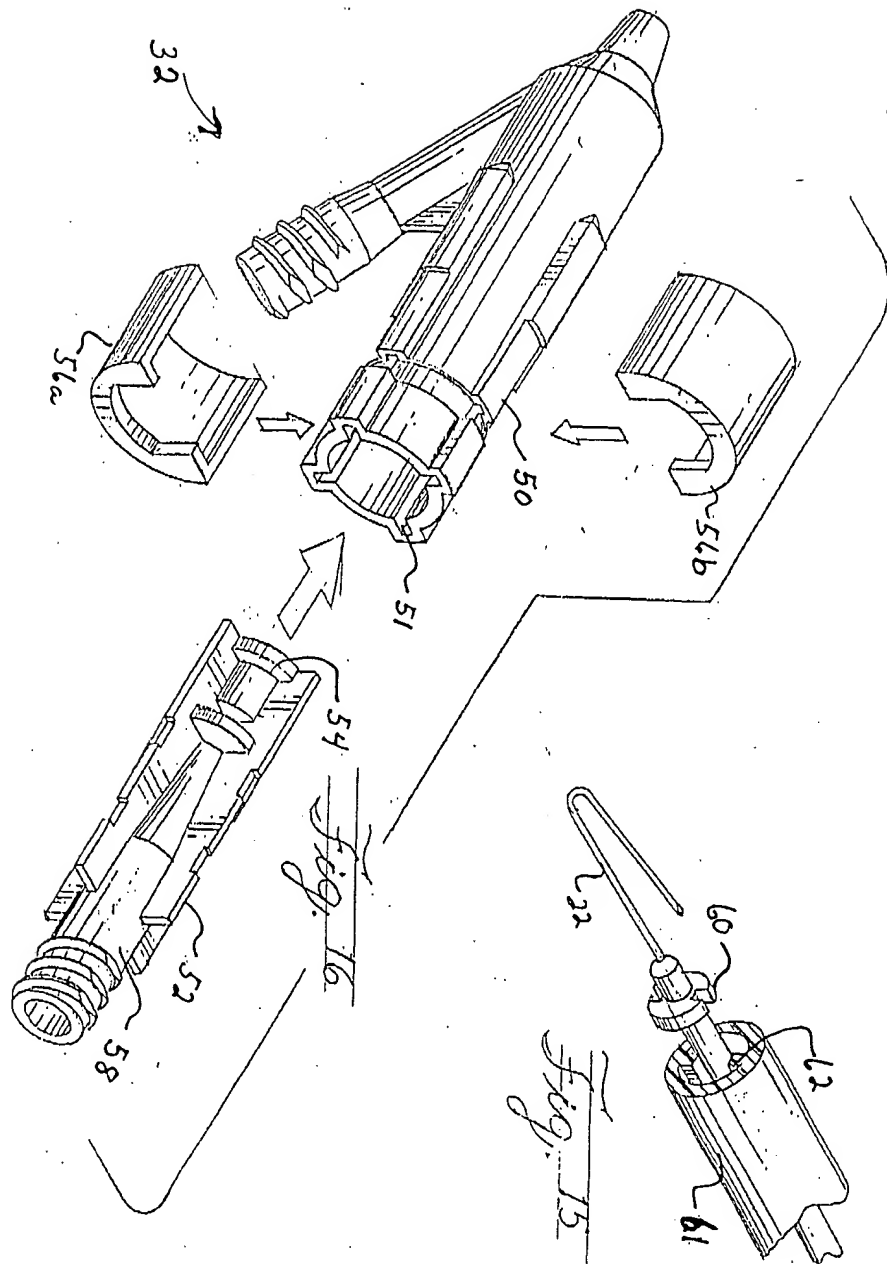


Fig. 6











UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
07/913,227	07/14/92	LINDEN	B 3570/113 216

EXAMINER MAGLIONE, C

GUSTAVO SILLER, JR.
WILLIAM BRINKS OLDS
HOFFER GILSON & LIONE LTD.
P.O. BOX 10395
CHICAGO, IL 60610

ART UNIT	PAPER NUMBER
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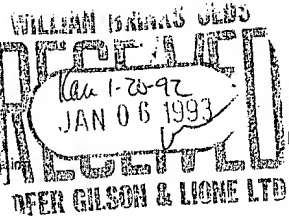
3306

5

DATE MAILED: 12/30/92

APR 22 2002

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS



☒ This application has been examined ☐ Responsive to communication filed on _____ ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), _____ days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- ☒ Notice of References Cited by Examiner, PTO-892.
- ☒ Notice re Patent Drawing, PTO-948.
- ☒ Notice of Art Cited by Applicant, PTO-1449.
- ☐ Notice of Informal Patent Application, Form PTO-152.
- ☐ Information on How to Effect Drawing Changes, PTO-1474.
- ☐

Part II SUMMARY OF ACTION

1. ☒ Claims 1-7 are pending in the application.

Of the above, claims _____ are withdrawn from consideration.

2. ☐ Claims _____ have been cancelled.

3. ☐ Claims _____ are allowed.

4. ☒ Claims 1-7 are rejected.

5. ☐ Claims _____ are objected to.

6. ☐ Claims _____ are subject to restriction or election requirement.

7. ☒ This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes:

8. ☐ Formal drawings are required in response to this Office action.

9. ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable. ☐ not acceptable (see explanation or Notice re Patent Drawing, PTO-948).

10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____ has (have) been ☐ approved by the examiner. ☐ disapproved by the examiner (see explanation).

11. ☐ The proposed drawing correction, filed on _____, has been ☐ approved. ☐ disapproved (see explanation).

12. ☐ Acknowledgment is made of the claim for priority under U.S.C. 119. The certified copy has ☐ been received. ☐ not been received.
☐ been filed in parent application, serial no. _____; filed on _____

13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.

14. ☐ Other

EXAMINER'S ACTION

Art Unit 336

Claims 1-7 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is indefinite because it is unclear how a drug is delivered through the puncture in the vessel. There seems to be no delivery means present, and one can not discern if the catheter is the delivery means.

In claim 7 there is no antecedent basis for the "distal end". Further, the claim is unclear because it is not known what a retracted or puncturing position is, or how the "puncturing element" extends when it is in the retracted position. The claim is also incomplete because there is set forth no structural communication or relationship between the "tube" and the catheter.

Finally, claim 7 is also found to be indefinite because the claim positively recites the combination of the catheter and the vessel wall, when only the subcombination of the catheter was to be claimed as indicated by the preamble.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Serial No. 913,227

-3-

Art Unit 336

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claim 7 is rejected under 35 U.S.C. § 102(b or e) as being clearly anticipated by Bogue et al., Hawkins et al. or Sewell, Jr.

Reference to Bogue et al. disclose a puncture tip 17, 0 means for moving the tip 37, a window 20 and a tube 13 for delivery of a fluid.

Hawkins discloses a puncture element 27, and Sewell, Jr. discloses a puncture element 16.

Claims 1-6 would be allowable if rewritten or amended to overcome the rejection under 35 U.S.C. § 112.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Corrine Maglione whose telephone number is (703) 308-2111.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0858.

CMH 12/28/92
Corrine Maglione:bhw
December 17, 1992

C. FRED ROSENBAUM
S. P. E.
ART UNIT 336

913227

33010

5

NOTICE OF REFERENCES CITED

APPLICANT(S)

Linden et al.

U.S. PATENT DOCUMENTS

*	DOCUMENT NO.	DATE	NAME	CLASS	SUB-CLASS	FILING DATE IF APPROPRIATE
A	4270535	6/81	Bogue et al.	1004	164A	
B	4799495	1/89	Hawkins et al.	128	754	
C	5152772	10/92	Sewell, Jr.	1000	159	7/91
D						
E						
F						
G						APR 22 2002
H						
I						
J						
K						

FOREIGN PATENT DOCUMENTS

*	DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG.	PP. SPEC.
L								
M								
N								
O								
P								
Q								

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)

R	
S	
T	
U	

EXAMINER

Maglione

DATE

12/10/92

C. Maglione

* A copy of this reference is not being furnished with this office action.
(See Manual of Patent Examining Procedure, section 707.05 (a).)

GROUP

APPLICATION NUMBER

9130227

NOTICE OF DRAFTSMAN'S PATENT DRAWING REVIEW

The PTO Draftsman review all originally filed drawings regardless of whether they were designated as Informal or formal.

The drawings filed 7/14/92A. ☐ are approved.B. ☒ are objected to under 37 CFR 1.84 for reason(s) checked below. The examiner will require submission of new, corrected drawings at the appropriate time. Corrected drawings must be submitted according to the instructions listed on the back of this Notice.

1. Paper and ink. 37 CFR 1.84(a)

- ☐
- Poor Quality Paper. Must Be White.
-
- Transparent Paper Not Allowed.
-
- Sheet(s) _____

2. Size of Sheet and Margins. 37 CFR 1.84(b)

Acceptable Paper Sizes and Margins

Margin	Paper Size		
	8 1/2 by 14 inches	8 1/2 by 13 inches	DIN size A4 21 by 29.7 cm.
Top	2 inches	1 inch	2.5 cm.
Left	1/4 inch	1/4 inch	2.5 cm.
Right	1/4 inch	1/4 inch	1.5 cm.
Bottom	1/4 inch	1/4 inch	1.0 cm.

- ☐
- Proper Size Paper Required. All
-
- Sheets Must be Same Size.
-
- Sheet(s) _____

☒ Proper Margins Required.Sheet(s) Fig 1, 15, 16
☒ Top ☐ Right
☐ Left ☐ Bottom

3. Character of Lines. 37 CFR 1.84(c)

- ☒
- Lines Pale, Rough and Blurred, or
-
- Jagged. Fig(s)
- 1-16

- ☐
- Solid Black Shading Not Allowed.
-
- Fig(s) _____

- 4.
- ☐
- Photographs Not Approved.

- ☐
- Comments:

5. Hatching and Shading. 37 CFR 1.84(d)

- ☐
- Shade Lines are Required.
-
- Fig(s) _____

- ☐
- Criss-Cross Hatching Not Allowed.
-
- Fig(s) _____

- ☐
- Double Line Hatching Not Allowed.
-
- Fig(s) _____

- ☐
- Parts in Section Must be Hatched
-
- Properly. Fig(s) _____

6. Reference Characters. 37 CFR 1.84(f)

- ☒
- Reference Characters Poor or Rough
-
- and Blurred. Fig(s)
- 1-16

- ☐
- Minimum 1/8 inch (3.2 mm.) in height
-
- is required. Fig(s) _____

- ☒
- Figure Legends Poor or Placed
-
- Incorrectly. Fig(s)
- 1-16

7. Views. 37 CFR 1.84(i) & (j)

- ☐
- Figures Must be Numbered Separately.

- ☐
- Figures Must Not be Connected
-
- Fig(s) _____

8. Identification of Drawings. 37 CFR 1.84(l)

- ☒
- Extraneous Matter or Copy Machine
-
- Marks Not Allowed. Fig(s)
- 1-16

- 9.
- ☐
- Changes Not Completed from Prior
-
- PTO-948 dated: _____

APR 22 2002

Telephone inquiries concerning this review should be directed to the Chief Draftsman at telephone number (703) 657-6204.

Reviewing Draftsman

9/14/92
Date

FORM 609-149

STATEMENT OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE
1992

Page several sheets if necessary

SERIAL NO.
07/913,227

ATTORNEY DOCKET NO.
3570/216

FILING DATE
July 14, 1992

GROUP ART UNIT
3306

APPLICANT(S): Bradley G. Linden et al.

REFERENCE DESIGNATION		U.S. PATENT DOCUMENTS				
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS/SUBCLASS	FILING DATE
<i>cmm</i>	A1	4,636,195	01/1987	Wolinsky		
<i>cmm</i>	A2	4,824,436	04/1989	Wolinsky		

FOREIGN PATENT DOCUMENTS						
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS/SUBCLASS	TRANSLATION YES NO

OTHER ART (Including Author, Title, Date, Pertinent Pages, etc.)		
<i>cmm</i>	A3	Article "Use of a Perforated Balloon Catheter to Deliver Concentrated Heparin Into the Wall of the Normal Canine Artery", by Harvey Wolinsky, MD, PhD, FACC. SWAN N. Thung, MD, New York, American College of Cardiology-0735-1097/90, JACC Vol. 15, No. 2, February 1990:4/5-81, pp. 475-481.
<i>cmm</i>	A4	Article "Phosphate Compounds of the Rabbit Red Blood Cell During Storage in Acid Citrate Dextrose (ACD) and ACD-Inosine", by Grant R. Bartlett and A. William Shafer (From the Scripps Clinic and Research Foundation, LaJolla, Calif.) (Submitted for publication June 8, 1959; accepted September 10, 1959), pp. 62-68
<i>cmm</i>	A5	Article "Effect of Controlled Adventitial Heparin Delivery On Smooth Muscle Cell Proliferation Following Endothelial Injury" by Elazer R. Edelman, David H. Adams and Morris J. Karnovsky, Proc. Natl. Acad. Sci. USA, Vol. 37, pp. 3773-3777, May 1990, Medical Sciences
	A6	
	A7	
	A8	

EXAMINER <i>Connie Maglione</i>	DATE CONSIDERED <i>12/10/92</i>
------------------------------------	------------------------------------

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 12-7-92

Date of Deposit

APR 22 2002

Karl A. Vick
Name of applicant, assignee or
Registered Representative

Karl A. Vick
Signature

12-7-92

Date of Signature

Our Case No. 3570/216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)

Bradley G. Linden et al.)

Serial No. 07/913,227)

Filed: July 14, 1992)

Group Art Unit 3306

For: Intra-Extravascular Drug)
Delivery Catheter and)
Method)

PRELIMINARY AMENDMENT

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

Preliminary to the first official action on the merits in the above-identified application, please enter the following amendments.

IN THE CLAIMS

Please cancel Claim 7 and enter new Claims 8 to 20 as follows.

--8. A drug delivery device comprising:

an elongated shaft adapted to be inserted into a vessel having a vessel wall;

a puncturing element coupled to said shaft;

said puncturing element having a retracted position in which said puncturing element does not engage said vessel wall; and
said puncturing element further having a puncturing position in which said puncturing element extends outwardly from said shaft to engage and puncture said vessel wall.--

--9. The device defined in Claim 8 wherein said puncturing element is housed inside an elongated catheter also adapted to be inserted into said vessel.--

--10. The device defined in Claim 9 wherein:
said puncturing element further comprises a puncturing tip for puncturing said vessel wall when said puncturing element is in said puncturing position; and
said catheter further comprises a window through which said puncturing tip extends when said puncturing element is in said puncturing position.--

--11. The device defined in Claim 9 wherein said catheter further comprises:
an inflatable balloon coupled to said catheter; and
an inflation lumen extending through said catheter for delivering inflation fluid to said balloon.--

--12. The device defined in Claim 8 further comprising means for moving said puncturing element from its retracted position to its puncturing position.--

--13. The device defined in Claim 12 further comprising means for moving said puncturing element from its puncturing position to its retracted position.--

--14. The device defined in Claim 13 further comprising means for guiding said puncturing element to its retracted position.--

--15. The device defined in Claim 8 wherein:
said shaft further comprises an inner shaft lumen;
said puncturing element further comprises a needle having
an inner needle lumen; and

said inner shaft lumen is in fluid communication with
said inner needle lumen so that fluid can flow from said inner
shaft lumen to said inner needle lumen.--

--16. The device defined in Claim 15 wherein said
needle further comprises a puncturing tip for engaging and
puncturing said vessel wall when said puncturing element is in said
puncturing position.--

--17. The device defined in Claim 16 wherein said
puncturing tip includes an opening in communication with said inner
needle lumen so that fluid in said inner needle lumen can flow out
of said tip opening.--

--18. The invention defined in Claim 17 further
comprising an injection device coupled to said inner shaft lumen
for injecting fluid through said inner shaft lumen.--

--18.¹⁹ The device defined in Claim 16 wherein said
puncturing tip has a beveled edge for puncturing said vessel wall.-

--19.²⁰ The device defined in Claim 8 wherein said
puncturing element comprises a needle having a tip for puncturing
said vessel wall.--

--20.²¹ The device defined in Claim 8 wherein:
said needle is bent into a substantially U-shape when
said puncturing element is in said retracted position; and
said needle is extended out to form a predetermined angle
when said needle is in said puncturing position.--

REMARKS

In reviewing this application prior to the issuance of the initial Office Action on the merits, it is believed that the invention will be more fully defined by canceling Claim 7 and adding new Claims 8 to 20. The proposed amendments do not involve any new matter or objectionable change, and accordingly, Applicants respectfully request that the Examiner enter the proposed amendments and consider the new claims.

Respectfully submitted,



Karl A. Vick
Registration No. 33,288

WILLIAN BRINKS OLDS HOFER
GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4247

TRANSMITTAL LETTER			Attorney's Docket No. 3570/216
Serial No. 07/913,227	Filing Date July 14, 1992	Examiner	Group Art Unit 3306
Inventor(s) Bradley G. Linden et al.			
Title of Invention Intra-Extravascular Drug Delivery Catheter and Method			

TO THE COMMISSIONER OF PATENTS AND TRADEMARKS

Transmitted herewith is Preliminary Amendment.

- ☐ Small entity status of this application under 37 CFR § 1.27 has been established by verified statement previously submitted.
- ☐ A verified statement to establish small entity status under 37 CFR §§ 1.9 and 1.27 is enclosed.
- ☐ Petition for a ___ month(s) extension of time.
- ☐ No additional fee is required.
- ☐ The fee has been calculated as shown below:

	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra
Total	19	Minus	20	0
Indep.	2	Minus	2	0
First Presentation of Multiple Dep. Claim				

Small Entity		or	Other Than Small Entity	
Rate	Add'l Fee		Rate	Add'l Fee
x \$11 = \$			x \$22 = \$	
x \$37 = \$			x \$74 = \$	
+ \$115 = \$			+ \$230 = \$	
total add'l fee	\$		total add'l fee	\$

- ☐ Please charge Deposit Account No. 23-1925 (WILLIAM BRINKS OLDS HOFER GILSON & LIONE) in the amount of \$_____. A duplicate copy of this sheet is enclosed.
- ☐ A check in the amount of \$_____ to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this communication or credit any overpayment to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.
- ☒ I hereby petition under 37 CFR § 1.136(a) for any extension of time required to ensure that this paper is timely filed. Please charge any associated fees which have not otherwise been paid to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

Karl A. Vick

Karl A. Vick
Registration No. 33,288
Attorney for Applicant

WILLIAM BRINKS OLDS HOFER
GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 11-2-92

Date of Deposit

Karl A. Vick

Name of applicant, assignee or
Registered Representative

Karl A. Vick

Signature

11-2-92

Date of Signature

Our Case No. 3570/216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
)
Bradley G. Linden et al.)
)
Serial No. 07/913,227)
)
Filed: July 14, 1992) Group Art Unit 3306
)
For: Intra-Extravascular Drug)
Delivery Catheter and)
Method)

INFORMATION DISCLOSURE STATEMENT

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

Pursuant to the duty of candor and good faith imposed upon each individual associated with the filing and prosecution of a U.S. patent application, Applicant hereby discloses the following references.

U.S. Patent No. 4,636,195

U.S. Patent No. 4,824,436

Article - "Use of a Perforated Balloon Catheter to Deliver Concentrated Heparin Into the Wall of the Normal Canine Artery"

Article - "Phosphate Compounds of the Rabbit Red Blood Cell During Storage in Acid Citrate Dextrose (ACD) and ACD-Inosine"

Article - "Effect of Controlled Adventitial Heparin Delivery on Smooth Muscle Cell Proliferation Following Endothelial Injury"

A listing of the above references is set forth on the attached PTO Form 1449.

A copy of

☒ each

☐ none

☐ only those listed below

of the references listed on PTO Form 1449 is supplied herewith.

This Information Disclosure Statement is being filed within three months after the filing date of the application, or before the mailing of the first office action on the merits, and therefore, no certification under § 1.97(e) or fee under § 1.17(p) is required.

In accordance with 37 CFR § 1.97(h), the filing of this Information Disclosure Statement shall not be construed to be an admission that the references listed herein are, or are considered to be, material to patentability as defined in 37 CFR § 1.56(b).

Respectfully submitted,



Karl A. Vick
Registration No. 33,288
Attorney for Applicant

WILLIAM BRINKS OLDS HOFER
GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4247

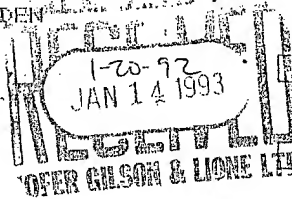


UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
07/913,227	07/14/92	LINDEN	B 3570/113 216

GUSTAVO SILLER, JR.
WILLIAM BRINKS OLDS
HOFFER GILSON & LIONE LTD.
P.O. BOX 10395
CHICAGO, IL 60610



EXAMINER
MAGLIONE, C

ART UNIT
3306

PAPER NUMBER
7

DATE MAILED: 01/11/93

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

Supplemental First Action APR 22 2002

- ☒ This application has been examined ☐ Responsive to communication filed on _____ ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), _____ days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- | | |
|---|--|
| 1. <input type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input type="checkbox"/> Notice re Patent Drawing, PTO-948. |
| 3. <input type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449. | 4. <input type="checkbox"/> Notice of Informal Patent Application, Form PTO-152. |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474. | 6. <input type="checkbox"/> |

Part II SUMMARY OF ACTION

1. ☒ Claims 1-6 and 8-21 are pending in the application.
Of the above, claims _____ are withdrawn from consideration.
2. ☐ Claims _____ have been cancelled.
3. ☐ Claims _____ are allowed.
4. ☒ Claims 1-6 and 8-21 are rejected.
5. ☐ Claims _____ are objected to.
6. ☐ Claims _____ are subject to restriction or election requirement.
7. ☒ This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. ☐ Formal drawings are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable. ☐ not acceptable (see explanation or Notice re Patent Drawing, PTO-948).
10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____ has (have) been ☐ approved by the examiner. ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction, filed on _____, has been ☐ approved. ☐ disapproved (see explanation).
12. ☐ Acknowledgment is made of the claim for priority under U.S.C. 119. The certified copy has ☐ been received ☐ not been received
☐ been filed in parent application, serial no. _____; filed on _____.
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. ☐ Other

EXAMINER'S ACTION

Serial No. 913,227

-2-

Art Unit 3306

Please note that applicant's preliminary amendment and the examiner's first action crossed in the mail. The following action is a supplemental first action, acting on newly added claims 8-21.

The numbering of claims is not accordance with 37 C.F.R. § 1.126. The original numbering of the claims must be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When claims are added, except when presented in accordance with 37 C.F.R. § 1.121(b), they must be renumbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 8-20 have been renumbered pages 8-21, respectively.

Please note that the claims had to be renumbered because of the presence of two claims numbered 18.

Claims 8-21 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 is found to be indefinite because the claim positively recites the combination of the puncturing element and the vessel wall, when only the subcombination of the puncturing element was to be claimed as indicated by the preamble.

Claim 9 is unclear because it is not made known if both the puncturing element and shaft are in the catheter.

There is no antecedent basis for "said needle" of claim 21.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 8-10 and 12-14 are rejected under 35 U.S.C. § 102(b) as being clearly anticipated by Hawkins et al.

Claims 8-14 are rejected under 35 U.S.C. § 102(e) as being clearly anticipated by Sewell, Jr.

Claims 8-9, 12-17 and 19-20 are rejected under 35 U.S.C. § 102(b) as being clearly anticipated by Bogue et al.

Claims 18 and 21 would be allowable if rewritten to overcome the rejection under 35 U.S.C. § 112 and to include all of the limitations of the base claim and any intervening claims.

Serial No. 913,227

-4-

Art Unit 3306

Claims 1-6 would be allowable if rewritten or amended to overcome the rejection under 35 U.S.C. § 112.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Corrine Maglione whose telephone number is (703) 308-2111.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0858.

CMM 1/11/93
C. Maglione/pw
January 07, 1993

C. FRED ROSENBAUM
S. P. E.
ART UNIT 336

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 7-12-93
Date of Deposit

APR 22 2002

Karl A. Vick
Name of applicant, assignee or
Registered Representative
Karl A. Vick
Signature
7-12-93
Date of Signature

Our Case No. 3570/216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
Bradley C. Linden et al.)
Serial No. 07/913,227)
Filed: July 14, 1992) Group Art Unit 3306
For: Intra-Extravascular Drug)
Delivery Catheter and)
Method)

AMENDMENT

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In response to the supplemental first office action mailed January 11, 1993, please enter the following amendments and consider the accompanying remarks.

IN THE SPECIFICATION

Page 1, line 24, change "can be" to -- is --;

Page 15, line 11, change '0.418"' to --0.0418"--; line 12, change '0.223"' to --0.0223"--; line 12, change '0.844"' to --0.0844"--.

IN THE CLAIMS

Please amend Claims 1, 6, 8, 9, 15, 18 and 20, and add new Claims 22 to 31 as follows.

In Claim 1, line 10, after "delivering", insert -- via a deliver means --;

6. (once amended) The method of claim 1 wherein the delivery means includes a puncturing element having a [includes an] drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

8. (once amended) A drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising:

an elongated shaft adapted to be inserted into the vessel;

said shaft comprising a puncturing element [coupled to said shaft;

said puncturing element] having a retracted position in which said puncturing element does not puncture [engage] said vessel wall; [and]

said puncturing element further having a puncturing position in which said puncturing element [extends outwardly from said shaft engage and puncture] engages and punctures said vessel wall; and

delivery means coupled to said shaft for delivering a drug outside the inner surface of the vessel wall through a puncture in the vessel wall.

9. (once amended) The device defined in Claim 8 wherein said shaft [puncturing element] is housed inside an elongated catheter also adapted to be inserted into said vessel.

15. (once amended) The device defined in Claim 8 wherein:

said shaft further comprises an inner shaft lumen;

said puncturing element further comprises a needle having an inner lumen in fluid communication with said inner shaft lumen;
and

said delivery means comprises said inner shaft lumen and said inner needle lumen [said inner shaft lumen is in fluid communication with said inner needle lumen so that fluid can flow from said inner shaft lumen to said inner needle lumen].

18. (once amended) The invention defined in Claim 17 wherein said delivery means further comprises [comprising] an injection device coupled to said inner shaft lumen for injecting fluid through said inner shaft lumen.

Claim 20, line 1, change dependency from "Claim 8" to -- Claim 20 --.

--22. (new) The device defined in Claim 20 wherein: said needle is bent to a first predetermined angle when said puncturing element is in said retracted position; and

said needle is extended out to form a second predetermined angle when said needle is in said puncturing position.

--23. (new) The device defined in Claim 20 wherein said needle comprises a tip pointed toward a distal end of said catheter when said needle is in said retracted position.--

--24. (new) The method of Claim 1 wherein said drug comprises an antiproliferative drug for the treatment of restenosis.--

--25. (new) The method of Claim 1 wherein said drug comprises an antiproliferative drug for the treatment of vascular disease.--

--26. (new) The method of Claim 1 wherein said drug comprises a specific inhibitor of cellular proliferation.--

--27. (new) The method of Claim 1 wherein said drug comprises a specific inhibitor of thrombin.--

--28. (new) The method of Claim 1 wherein said drug comprises a specific inhibitor of platelets.--

--29. (new) The method of claim 1 wherein said drug comprises a genetic material. --

--30. (new) The method of claim 1 wherein said drug comprises a genetic material that when incorporated into cells results in the expression of therapeutic materials.--

--31. (new) The method of claim 1 wherein said drug is incorporated into a time released matrix.--

Remarks

Claims 1-6 and 8-21 are pending in this application. In the supplemental first office action mailed January 11, 1993, all of the pending claims were rejected. In particular, Claims 1-6 and 8-21 have been rejected under 35 USC §112 as allegedly indefinite. Claims 8-20 and 12-14 have been rejected under 35 USC §102 as allegedly anticipated by Hawkins. Claims 8-14 have been rejected under 35 USC §102 as allegedly anticipated by Sewell. Claims 8-9, 12-17 and 19-20 have been rejected under 35 USC §102 as allegedly anticipated by Bogue. Reconsideration of the outstanding rejections is respectfully requested.

The Examiner has indicated that Claims 1-6, 18, and 21 would be allowable if rewritten to eliminate their dependency on currently rejected claims. Applicants acknowledge this statement regarding potential allowability of these claims, and aside from a few amendments of form, applicants make no further statement about these claims.

Some of the claims have been amended to clarify the distinctions between the claimed invention and the cited art. In particular, claim 8 has been amended to recite a structure that is not shown or suggested by the cited art, whether taken alone or in combination.

In particular, Claim 8 as amended calls for a drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising: an elongated shaft adapted to be inserted into the vessel; the shaft comprising a puncturing element having a retracted position in which the puncturing element does not puncture the vessel wall; the puncturing element further having a puncturing position in which the puncturing element

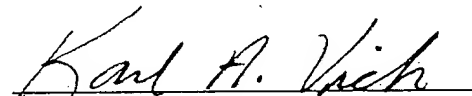
engages and punctures the vessel wall; and delivery means coupled to the shaft for delivering a drug outside the inner surface of the vessel wall through a puncture in the vessel wall.

The amended claims, and particularly amended Claim 8, clarify that the devices disclosed in the cited art are completely different from the claimed invention in numerous respects. The most important and fundamental of these differences is the fact that the cited art devices do not and cannot deliver drugs to a vessel wall as recited in the claims.

Accordingly, Applicants submit that the pending claims as amended are in condition for allowance, and early notice to this effect is respectfully requested.

If, for any reason, the Examiner is unable to allow the application on the next office action and feels that a direct communication would be beneficial, the Examiner is respectfully urged to contact the undersigned attorney directly at (312) 321-4247.

Respectfully submitted,


Karl A. Vick
Registration No. 33,288
Attorney for Applicant

WILLIAM BRINKS OLDS HOFER
GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4247

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 7-12-93
Date of Deposit

Karl A. Vick
Name of applicant, assignee or
Registered Representative
Karl A. Vick
Signature
7-12-93
Date of Signature

Our Case No. 3570/216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
Bradley C. Linden et al.)
Serial No. 07/913,227)
Filed: July 14, 1992) Group Art Unit 3306
For: Intra-Extravascular Drug)
Delivery Catheter and)
Method)

PETITION AND FEE FOR EXTENSION OF TIME (37 CFR § 1.136(a))

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

This is a petition for an extension of the time to respond to the Office Action of January 11, 1993 for a period of three months.



Applicant is:

☐

a small entity, verified statement is:

☐

attached

☐

already filed

☒

other than small entity

	<u>Extension Months</u>	<u>Other Than Small Entity</u>	<u>Small Entity</u>
<input type="checkbox"/>	One Month	\$110	\$55
<input type="checkbox"/>	Two Months	\$360	\$180
<input checked="" type="checkbox"/>	Three Months	\$840	\$420
<input type="checkbox"/>	Four Months	\$1,320	\$660

Fee Payment

- ☐ Attached is a check for \$840 for the Petition fee.
- ☐ Charge Petition fee to Deposit Account No. 23-1925. A duplicate copy of this Petition is attached.
- ☒ Charge any additional fee required or credit for any excess fee paid to Deposit Account No. 23-1925. A duplicate copy of this Petition is attached.

Respectfully submitted,

Karl A. Vick

Karl A. Vick
Registration No. 33,288
Attorney for Applicant

WILLIAM BRINKS OLDS HOFER
GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

TRANSMITTAL LETTER			Attorney's Docket No. 3570/216
Serial No. 07/913,227	Filing Date July 14, 1992	Examiner	Group Art Unit 3306
Inventor(s) Bradley C. Linden et al.			
Title of Invention Intra-Extravascular Drug Delivery Catheter and Method			

TO THE COMMISSIONER OF PATENTS AND TRADEMARKS

Transmitted herewith is Amendment

- ☐ Small entity status of this application under 37 CFR § 1.27 has been established by verified statement previously submitted.
- ☐ A verified statement to establish small entity status under 37 CFR §§ 1.9 and 1.27 is enclosed.
- ☒ Petition for a 3 month(s) extension of time.
- ☐ No additional fee is required.
- ☒ The fee has been calculated as shown below:

	Claims Remaining After Amendment		Highest No. Previously Paid For	Present. Extra
Total	<u>30</u> 19	Minus	20	<u>10</u> 19
Indep.	2	Minus	2	0
First Presentation of Multiple Dep. Claim				

Small Entity		or	Other Than Small Entity	
Rate	Add'l Fee		Rate	Add'l Fee
x \$11 = \$			x \$22 = \$	
x \$37 = \$			x \$74 = \$	
+\$115 = \$			+ \$230 = \$	
total add'l fee	\$		total add'l fee	\$

- ☐ Please charge Deposit Account No. 23-1925 (WILLIAN BRINKS OLDS HOFER GILSON & LIONE) in the amount of \$_____. A duplicate copy of this sheet is enclosed.
- ☐ A check in the amount of \$_____ to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this communication or credit any overpayment to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.
- ☒ I hereby petition under 37 CFR § 1.136(a) for any extension of time required to ensure that this paper is timely filed. Please charge any associated fees which have not otherwise been paid to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

Karl A. Vick
Karl A. Vick
Registration No. 33,288
Attorney for Applicant

WILLIAN BRINKS OLDS HOFER
GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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07/913,227 07/14/92 LINDEN

33M1/1026

GUSTAVO SILLER, JR.
WILLIAM BRINKS OLDS
HOFFER GILSON & LIONE LTD.
P.O. BOX 10395
CHICAGO, IL 60610

EXAMINER	
MAGLIONE, C	
ART UNIT	PAPER NUMBER
	10

3306

DATE MAILED:

APR 22 2002

10/26/93

12/26/93

12/26/94

2/26/94

3/26/94

4/26/94

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

☐ This application has been examined ☒ Responsive to communication filed on July 15, 1993 ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), _____ days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- | | |
|---|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input type="checkbox"/> Notice of Draftsman's Patent Drawing Review, PTO-948. |
| 3. <input type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449. | 4. <input type="checkbox"/> Notice of Informal Patent Application, PTO-152. |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474. | 6. <input type="checkbox"/> |

Part II SUMMARY OF ACTION

1. ☒ Claims 1-6 and 8-31 are pending in the application.
Of the above, claims _____ are withdrawn from consideration.
2. ☐ Claims _____ have been cancelled.
3. ☐ Claims _____ are allowed.
4. ☒ Claims 1-6, 8-10, 12-14, 20, 21 and 23-31 are rejected.
5. ☒ Claims 11, 15-19 and 22 are objected to.
6. ☐ Claims _____ are subject to restriction or election requirement.
7. ☐ This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. ☐ Formal drawings are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☐ not acceptable (see explanation or Notice of Draftsman's Patent Drawing Review, PTO-948).
10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____, has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction, filed _____, has been ☐ approved; ☐ disapproved (see explanation).
12. ☐ Acknowledgement is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received ☐ not been received ☐ been filed in parent application, serial no. _____; filed on _____.
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. ☐ Other

NOV - 8 1993

WILLIAM BRINKS HOFFER
RECEIVED
NOV - 1 1993
RECEIVED
GILSON & LIONE

EXAMINER'S ACTION

Serial Number: 07/913,227

-2-

Art Unit: 3306

APR 22 2006

The amendment filed July 15, 1993 is objected to under 35 U.S.C. § 132 because it introduces new matter into the specification. 35 U.S.C. § 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: the new dimensions which were inserted on page 15 in lines 11 and 12 in place of the originally filed dimensions.

Applicant is required to cancel the new matter in the response to this Office action.

Claims 5, 21 and 23-41 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

There is no antecedent basis for "said needle" of claim 21.

There is no antecedent basis for "said catheter" of claim 23, and the claim is further found to be indefinite because it is not clear which end is the distal end.

Claims 5 and 24-41 are rejected as being drawn to the old combination of a drug delivery device and a particular drug to be delivered by the device. This combination is shown to be old by the patent to Imran which discloses broadly the same elements, a drug delivery device having the structure as claimed and a plurality of drugs to be delivered by the device, functionally interrelated in the same manner to produce substantially the same results. The combination of claims 5 and 24-41 differs from that shown in Imran in setting forth the specific type of drugs to be used in the drug delivery device. Since the latter does not modify

Art Unit: 3306

the action of the other elements recited in the claims in any material manner, no new combination is seen to exist. Please refer to MPEP 706.03(j).

The indicated allowability of claims 1-6 is withdrawn in view of the newly discovered prior art to Imran. The delay in citation of this art is regretted. Rejections based on the newly discovered prior art follow.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 1-4, 6, 8-10, 12-14, 20 and 23 are rejected under 35 U.S.C. § 102(e) as being clearly anticipated by Imran.

Imran discloses a drug delivery device for delivering a plurality of different drugs to the myocardium of the heart. The human heart is clearly a vessel in the body, the myocardium being the vessel wall. The device comprises a catheter 13 within which is found a shaft 32 and a puncturing element 36 connected thereto. The puncturing element can be considered a needle, since one definition of a needle is a sharp tube. The distal tip of the Imran device is noted to be at 16, and it is seen in the figures that the tip of the needle clearly faces in the distal direction when in the retracted or extended position. Further, upon use of the device, the drug can be injected through the hole formed by the puncture element,

Art Unit: 3306

or anywhere else in relation to the hole, depending on how the user has the device positioned when the drug is sent through the drug lumen.

The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Claims 5 and 24-31 are rejected under 35 U.S.C. § 103 as being unpatentable over Imran.

The drug delivery device and the drug which is delivered by the device, as set forth by applicant, is seen as merely an old combination. Imran broadly discloses the combination, specifically disclosing the structure of the drug delivery device and the use of a "plurality of chemicals" therewith. To put any specific chemical or drug in the device will not change the way the device functions, the cooperation of elements would be the same as would the end result. Therefore, in view of the teachings, it would have been obvious to one of ordinary skill in the art to use the drug delivery device of Imran with any choice of drug or chemical,

Serial Number: 07/913,227

-5-

Art Unit: 3306

since the use of any one drug is not more critical than the use of another and the resulting function of the device does not change.

Claims 11, 15-19 and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 21 would be allowable if rewritten to overcome the rejection under 35 U.S.C. § 112 and to include all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Corrine Maglione whose telephone number is (703) 308-2111.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0858.

"Kareen" "Mag ~~leone~~-e"

CMM 10/6/93
Corrine Maglione
October 6, 1993

C. FRED ROSENBAUM
S. P. E.
ART UNIT 336

913227

3306

10

NOTICE OF REFERENCES CITED

APPLICANT(S)

Linden et al.

U.S. PATENT DOCUMENTS

	DOCUMENT NO.	DATE	NAME	CLASS	SUB-CLASS	FILING DATE IF APPROPRIATE
A	5236424	8/93	Imran	607	280	6/92
B						
C						
D						
E						
F						
G						
H						
I						
J						
K						

APR 22 2002

FOREIGN PATENT DOCUMENTS

	DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG.	PP. SPEC.
L								
M								
N								
O								
P								
Q								

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)

R	
S	
T	
U	

EXAMINER

Magliore

DATE

10/6/93

Corinne Magliore

* A copy of this reference is not being furnished with this office action.
(See Manual of Patent Examining Procedure, section 707.05 (a).)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 2-28-94
Date of Deposit

APR 22 2002

Karl A. Vick
Name of applicant, assignee or
Registered Representative
Karl A. Vick
Signature
2-28-94
Date of Signature

Our Case No. 3570/216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)	
)	
Bradley C. Linden et al.)	
)	
Serial No.: 07/913,227)	Examiner C. Maglione
)	
Filed: July 14, 1992)	Group Art Unit 3306
)	
For: Intra-Extravascular Drug Delivery)	
Catheter and Method)	

AMENDMENT

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In response to the office action dated October 26, 1993, please enter the following amendments and consider the accompanying remarks.

IN THE CLAIMS

Please amend Claims 1, 6, 8, 12, 13, 14, 21, and 23, as follows.

1.(twice amended) A method of treating a vessel having a vessel wall with an inner surface, the method comprising the steps of:

inserting a catheter having a vessel puncturing element disposed therein into [the] a substantially tubular vessel;

positioning the puncturing element at the site in the vessel to be treated;

[puncturing] moving said puncturing element in a direction substantially non-parallel with respect to a portion of said catheter that contains said puncturing element such that said puncturing element punctures the vessel wall at the site to be treated with the puncturing element; and

delivering via a delivery means a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall.

6.(twice amended) The method of claim 1 wherein the delivery means includes [a] said puncturing element having a drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

8.(twice amended) A drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising:

an elongated shaft adapted to be inserted into [a vessel having a] the vessel [wall];

said shaft comprising a puncturing element having a retracted position in which said puncturing element does not puncture said vessel wall, said puncturing element being housed in a portion of said shaft when said puncturing element is in said retracted position;

said puncturing element further having a puncturing position in which said puncturing element engages and punctures said vessel wall, said puncturing element being substantially non-parallel with respect to said portion of said shaft when said

puncturing element is in said puncturing position; and

delivery means coupled to said shaft for delivering a drug outside the inner surface of the vessel wall through a puncture in the vessel wall.

12.(one amended) The device defined in Claim 8 further comprising [means for moving] a coupling that moves said puncturing element from its retracted position to its puncturing position.

13.(once amended) The device defined in Claim 12 [further comprising means for moving] wherein said coupling also moves said puncturing element from its puncturing position to its retracted position.

14.(once amended) The device defined in Claim 13 further comprising [means for guiding] a guide that guides said puncturing element to its retracted position.

21.(once amended) The device defined in Claim [8] 20 wherein:

said needle is bent into a substantially U-shape when said puncturing element is in said retracted position; and

said needle is extended out to form a predetermined angle when said needle is in said puncturing position.

23.(once amended) The device defined in Claim 20 wherein said needle [comprises a tip pointed toward a distal end of said catheter] is substantially parallel with said portion of said shaft when said needle is in said retracted position, said needle also being substantially non-parallel with said portion of said shaft when said needle is in said puncturing position.

REMARKS

Claims 1-6 and 8-31 are pending in this application. In the office action mailed October 26, 1993, all of the pending claims were either rejected or objected to. In particular, Claims 5, 21, and 23-31 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Claims 5 and 24-31 were rejected as being drawn to an old combination of a drug delivery device and a particular drug to be delivered by the device. The drug delivery device is allegedly shown by U.S. patent no. 5,236,424 to Imran. Claims 1-4, 6, 8-10, 12-14, 20, and 23 were rejected under 35 U.S.C. § 102(e) as allegedly anticipated by Imran. Claims 5 and 24-31 were rejected under 35 U.S.C. § 103 as allegedly obvious in view of Imran. Claims 11, 15-19, and 22 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claim 21 would be allowable if rewritten to overcome the rejection under § 112 and to include all of the limitations of the base claim and any intervening claims.

Additionally, the Examiner has objected to previously requested amendments to the specification. The Examiner has found that the added material contains new matter.

Reconsideration of the current rejections and objections is respectfully requested. For the following reasons, Applicant respectfully submits that the cited Imran reference does not anticipate or render obvious the combination defined in the amended claims.

Regarding the previously requested amendments to the specification, Applicants respectfully submit that the originally filed dimensions of the D-shaped cams 38 (shown in Figures 7 and 8) were inadvertent typographical errors. That the incorrect dimensions were inadvertent typographical errors is shown by the fact that the incorrectly typed dimensions involved a misplaced decimal point and not a completely different number having all new

digits. Also, the D-shaped cam 38 fits inside the catheter shaft 21, and exemplary dimensions for the shaft 21 are stated in the specification (page 11, lines 23 and 24) as 4F (about 0.053") or 8F (about 0.080"). If the cams 38 were made with the incorrectly typed dimensions, they would be far too large to fit within the catheter shaft 21. Accordingly, Applicants respectfully submit that the specification as a whole supports a conclusion that the originally filed dimensions of the cams 38 were inadvertently typed with a misplaced decimal point, and the previously requested amendments to these dimensions simply correct typographical errors and do not introduce new matter.

With respect to the rejections under 35 U.S.C. § 112, second paragraph, Applicants have amended Claims 21 and 23 to provide proper antecedents and remove the reference to a "distal" end.

With respect to the rejections based on Imran, Applicants have amended the claims to more clearly set forth the distinctions between the Imran and the claimed subject matter. In particular, the claims more clearly define a drug delivery catheter capable of delivering a drug to the wall of a relatively small and delicate tubular body vessel surrounding the catheter. The claimed invention accomplishes this by, inter alia, moving its puncturing element at an angle away from its catheter shaft such that the puncturing element will contact the walls of the tubular body vessel surrounding the catheter. Additionally the claimed invention describes a novel puncturing element structure that allows it to move at an angle away from its catheter shaft when moving to its puncturing position. In contrast, the Imran device's puncturing element is relatively straight, large and bulky and moves parallel with respect to its catheter to make a direct puncture through the relatively thick and tough myocardium layers of the heart.

In conclusion, Applicants respectfully submit that every ground for rejection has been overcome by the amendments and remarks herein. Accordingly, the application is in condition for

allowance, and early notice to this effect would be greatly appreciated.

If, for any reason, the Examiner is unable allow the application on the next office action and feels that a telephone conference would help clear up any unresolved matters, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number listed below.

Respectfully submitted,

Karl A. Vick

Karl A. Vick
Registration No. 33,288
Attorney for Applicant

WILLIAN BRINKS HOFER
GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4247

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 2-28-94

Date of Deposit

Karl A. Vick

Name of applicant, assignee or
Registered Representative

Karl A. Vick

Signature

2-28-94

Date of Signature

Our Case No. 3570-216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
)
Bradley C. Linden et al.)
)
Serial No.: 07/913,227) Examiner C. Maglione
)
Filed: July 14, 1992) Group Art Unit 3306
)
For: Intra-Extravascular Drug)
Delivery Catheter and Method)

PETITION AND FEE FOR EXTENSION OF TIME (37 CFR § 1.136(a))

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

This is a petition for an extension of the time to respond to the Office Action dated October 26, 1993 for a period of one month.

☒

Applicant is:

☐

a small entity, verified statement is:

☐

attached

☐

already filed

☒

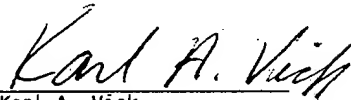
other than small entity

	<u>Extension Months</u>	<u>Other Than Small Entity</u>	<u>Small Entity</u>
<input checked="" type="checkbox"/>	One Month	\$110	\$55
<input type="checkbox"/>	Two Months	\$360	\$180
<input type="checkbox"/>	Three Months	\$840	\$420
<input type="checkbox"/>	Four Months	\$1,320	\$660

Fee Payment

- ☒ Attached is a check for \$110.00 for the Petition fee.
- ☐ Charge Petition fee to Deposit Account No. 23-1925. A duplicate copy of this Petition is attached.
- ☒ Charge any additional fee required or credit for any excess fee paid to Deposit Account No. 23-1925. A duplicate copy of this Petition is attached.

Respectfully submitted,


 Karl A. Vick
 Registration No. 33,288
 Attorney for Applicant

WILLIAM BRINKS HOFER
 GILSON & LIONE
 P.O. BOX 10395
 CHICAGO, ILLINOIS 60610
 (312) 321-4200

TRANSMITTAL LETTER			Case No. 3570-216
Serial No. 07/913,227	Filing Date July 14, 1992	Examiner C. Maglione	Group Art Unit 3306
Inventor(s) Bradley C. Linden et al.			
Title of Invention Intra-Extravascular Drug Delivery Catheter and Method			

TO THE COMMISSIONER OF PATENTS AND TRADEMARKS

Transmitted herewith is Amendment

- ☐ Small entity status of this application under 37 CFR § 1.27 has been established by verified statement previously submitted.
- ☐ A verified statement to establish small entity status under 37 CFR §§ 1.9 and 1.27 is enclosed.
- ☒ Petition for a 1 month(s) extension of time.
- ☐ No additional fee is required.
- ☐ The fee has been calculated as shown below:

	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra
Total		Minus		
Indep.		Minus		
First Presentation of Multiple Dep. Claim				

Small Entity		or	Other Than Small Entity	
Rate	Add'l Fee		Rate	Add'l Fee
x \$11 = \$			x \$22 = \$	
x \$37 = \$			x \$74 = \$	
+\$115 = \$			+ \$230 = \$	
total \$			total \$	
add'l fee			add'l fee	

- ☐ Please charge Deposit Account No. 23-1925 (WILLIAM BRINKS HOFER GILSON & LIONE) in the amount of \$_____. A duplicate copy of this sheet is enclosed.
- ☐ A check in the amount of \$_____ to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this communication or credit any overpayment to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.
- ☒ I hereby petition under 37 CFR § 1.136(a) for any extension of time required to ensure that this paper is timely filed. Please charge any associated fees which have not otherwise been paid to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

Karl A. Vick
Karl A. Vick
Registration No. 33,288
Attorney for Applicant

WILLIAM BRINKS HOFER
GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
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07/913,227 07/14/92 LINDEN

B 3570/113

EXAMINER
MAGLIONE, C

33M1/0401

GUSTAVO SILLER, JR.
WILLIAM BRINKS OLDS
HOFER GILON & LIONE LTD.
P.O. BOX 10395
CHICAGO, IL 60610

ART UNIT PAPER NUMBER

3306

13

DATE MAILED: 04/01/94

NOTICE OF ALLOWABILITY

APR 22 2002

PART I.

- ☒ This communication is responsive to the amendment filed March 27, 1994.
- ☒ All the claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice Of Allowance And Issue Fee Due or other appropriate communication will be sent in due course.
- ☒ The allowed claims are 1-6, 8, 10-31 (renumbered 1-29).
- ☐ The drawings filed on _____ are acceptable.
- ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received, ☐ not been received. ☐ been filed in parent application. Serial No. _____, filed on _____.
- ☒ Note the attached Examiner's Amendment.
- ☒ Note the attached Examiner Interview Summary Record, PTOL-413.
- ☐ Note the attached Examiner's Statement of Reasons for Allowance.
- ☐ Note the attached NOTICE OF REFERENCES CITED, PTO-892.
- ☐ Note the attached INFORMATION DISCLOSURE CITATION, PTO-1449.

PART II.

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" indicated on this form. Failure to timely comply will result in the ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

- ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
- ☒ APPLICANT MUST MAKE THE DRAWING CHANGES INDICATED BELOW IN THE MANNER SET FORTH ON THE REVERSE SIDE OF THIS PAPER.
 - ☒ Drawing informalities are indicated on the NOTICE RE PATENT DRAWINGS, PTO-948, attached hereto or to Paper No. 5. CORRECTION IS REQUIRED.
 - ☐ The proposed drawing correction filed on _____ has been approved by the examiner. CORRECTION IS REQUIRED.
 - ☐ Approved drawing corrections are described by the examiner in the attached EXAMINER'S AMENDMENT. CORRECTION IS REQUIRED.
 - ☒ Formal drawings are now REQUIRED.

Any response to this letter should include in the upper right hand corner, the following information from the NOTICE OF ALLOWANCE AND ISSUE FEE DUE: ISSUE BATCH NUMBER, DATE OF THE NOTICE OF ALLOWANCE, AND SERIAL NUMBER.

Attachments:

- ☒ Examiner's Amendment
- ☒ Examiner Interview Summary Record, PTOL-413
- ☐ Reasons for Allowance
- ☐ Notice of References Cited, PTO-892
- ☐ Information Disclosure Citation, PTO-1449
- ☐ Notice of Informal Application, PTO-152
- ☐ Notice re Patent Drawings, PTO-948
- ☐ Listing of Bonded Draftsmen
- ☐ Other

Serial Number: 07/913,227

APR 22 2006

-2-

Art Unit: 3306

An Examiner's Amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 C.F.R. § 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the Issue Fee.

Authorization for this Examiner's Amendment was given in a telephone interview with Karl Vick on March 28, 1994.

The application has been amended as follows:

Claim 8 line 4 "shaft" has been deleted and replaced with --catheter--; line 6 "shaft" has been deleted and replaced with --catheter--; line 8 --at least a portion of-- has been inserted after "wall,"; line 9 "shaft" has been deleted and replaced with --catheter--; line 14 "shaft" has been deleted and replaced with --catheter--; and line 16 "shaft" has been deleted and replaced with --catheter--.

Claim 9 has been canceled.

Claim 10 line 1 "9" has been deleted and replaced with --8--.

Claim 11 line 1 "9" has been deleted and replaced with --8--.

Claim 15 line 3 has been deleted in full; line 4 --an elongated shaft having a proximal and a distal end and an inner shaft lumen, and-- has been inserted after "comprises" and --,attached to said distal end of said shaft,-- has been inserted after "needle"; and line 5 -- which is-- has been inserted after "lumen".

Claim 23 lines 4 and 6 "shaft" has been deleted and replaced with --catheter--.

Serial Number: 07/913,227

-3-

Art Unit: 3306

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Corrine Maglione whose telephone number is (703) 308-2111.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0858.

CM 3/28/94
Corrine Maglione
March 28, 1994

C. FRED ROSENBAUM
S. P. E.
ART UNIT 336



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
---------------	-------------	-----------------------	---------------------

EXAMINER

ART UNIT	PAPER NUMBER
----------	--------------

13

DATE MAILED:

EXAMINER INTERVIEW SUMMARY RECORD

All participants (applicant, applicant's representative, PTO personnel):

APR 22 2002

(1) Karl Vick (3) _____
(2) Corrine Maglione (4) _____

Date of interview 3/28/94

Type: ☒ Telephonic ☐ Personal (copy is given to ☐ applicant ☐ applicant's representative).

Exhibit shown or demonstration conducted: ☐ Yes ☒ No. If yes, brief description: _____

Agreement ☒ was reached with respect to some or all of the claims in question. ☐ was not reached.

Claims discussed: 8-11 and 15

Identification of prior art discussed: None

Description of the general nature of what was agreed to if an agreement was reached, or any other comments: Counsel agreed to changes made to the above listed claims by an Examiner's Amendment, to clear up some slight language problems.

fuller description, if necessary, and a copy of the amendments, if available, which the examiner agreed would render the claims allowable must be attached. Also, where no copy of the amendments which would render the claims allowable is available, a summary thereof must be attached.)

☒ 1. It is not necessary for applicant to provide a separate record of the substance of the interview.

Unless the paragraph below has been checked to indicate to the contrary, A FORMAL WRITTEN RESPONSE TO THE LAST OFFICE ACTION IS NOT REQUIRED AND MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW (e.g., items 1-7 on the reverse side of this form). If a response to the last Office action has already been filed, then applicant is given one month from this interview date to provide a statement of the substance of the interview.

☒ 2. Since the examiner's interview summary above (including any attachments) reflects a complete response to each of the objections, rejections and requirements that may be present in the last Office action, and since the claims are now allowable, this completed form is considered to fulfill the response requirements of the last Office action. Applicant is not relieved from providing a separate record of the substance of the interview unless box 1 above is also checked.

Corrine Maglione
Examiner's Signature



**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
07/913.227	07/14/92	LINDEN	3570/113

75F1/0819

GUSTAVO SILLER, JR.
WILLIAM BRINKS OLDS
HOFER GILSON & LIONE LTD.
P.O. BOX 10395
CHICAGO, IL 60610

EXAMINER	
MAGLIONE, C	
ART UNIT	PAPER NUMBER
3306	14

DATE MAILED:

08/19/94

NOTICE OF ABANDONMENT

APR 22 2002

This application is abandoned in view of:

- ☐ Applicant's failure to respond to the Office letter, mailed _____.
- ☐ Applicant's letter of express abandonment which is in compliance with 37 C.F.R. 1.138.
- ☐ Applicant's failure to timely file the response received _____ within the period set in the Office letter.
- ☒ Applicant's failure to pay the required issue fee within the statutory period of 3 months from the mailing date of 07-01-94 of the Notice of Allowance.

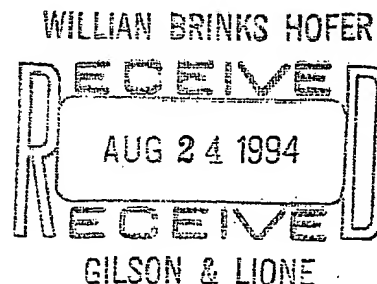
- ☐ The issue fee was received on _____.
- ☐ The issue fee has not been received in Allowed Files Branch as of _____.

In accordance with 35 U.S.C. 151, and under the provisions of 37 C.F.R. 1.316(b), applicant(s) may petition the Commissioner to accept the delayed payment of the issue fee if the delay in payment was unavoidable. The petition must be accompanied by the issue fee, unless it has been previously submitted, in the amount specified by 37 C.F.R. 1.17 (I), and a verified showing as to the causes of the delay.

If applicant(s) never received the Notice of Allowance, a petition for a new Notice of Allowance and withdrawal of the holding of abandonment may be appropriate in view of *Delgar Inc. v. Schuyler*, 172 U.S.P.Q. 513.

- ☐ Applicant's failure to timely correct the drawings and/or submit new or substitute formal drawings by _____ as required in the last Office action.
☐ The corrected and/or substitute drawings were received on _____.
- ☐ The reason(s) below.

DIRECT ANY INQUIRIES TO :
PUBLISHING DIVISION
MARCIA CAMPBELL
(703) 305-8190
OR
PRISCILLA FULLER
(703) 305-8203



PART C - CHARGE TO DEPOSIT ACCOUNT

CORRESPONDENCE ADDRESS

GUSTAVO SILLER, JR.
 WILLIAM BRINKS OLDS
 HOFER GILON & LIONE LTD.
 P.O. BOX 10395
 CHICAGO, IL 60610

33M1/0401

APR 22 2002

ERIES CODE/SERIAL NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
07/913,227	07/14/92	029	MAGLIONE, C	3306 04/01/94
st Named plicant LINDEN, BRADLEY C.				
OF NTION INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD				

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
3 3570/113	604-053.000	052	UTILITY	NO	\$1170.00	07/01/94

DO NOT USE THIS SPACE

2a. The following fees are enclosed:

☐ Issue Fee ☐ Advanced Order - # of Copies _____
 (Minimum of 10)

2b. The following fees should be charged to:

DEPOSIT ACCOUNT NUMBER _____

☐ Issue Fee ☐ Advanced Order - # of Copies _____
☐ Any Deficiencies in Enclosed Fees (Minimum of 10)

The COMMISSIONER OF PATENTS AND TRADEMARKS is requested to apply the Issue Fee to the application identified above.

(Signature of party in interest of record)

(Date)

NOTE: The Issue Fee will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the Patent and Trademark Office.

TRANSMIT THIS FORM WITH PART B WHEN AUTHORIZING USE OF A DEPOSIT ACCOUNT

PART B - ISSUE FEE TRANSMITTAL

MAILING INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE. Blocks 2 through 6 should be completed where appropriate. Further correspondence including the Issue Fee Receipt, the Patent, advanced orders and notification of maintenance fees will be mailed to addressee entered in Block 1 unless you direct otherwise, by: (a) specifying a new correspondence address in Block 3 below; or (b) providing the PTO with a separate "SEE ADDRESS" for maintenance fee notifications with the payment of Issue Fee or thereafter. **See reverse for Certificate of Mailing.**

CORRESPONDENCE ADDRESS <div style="text-align: right; margin-right: 50px;">33M1/0401</div> GUSTAVO SILLER, JR. WILLIAM BRINKS OLDS HOFFER GILON & LIONE LTD. P.O. BOX 10395 CHICAGO, IL 60610	2. INVENTOR(S) ADDRESS CHANGE (Complete only if there is a change) INVENTOR'S NAME <hr/> Street Address <hr/> City, State and ZIP Code <hr/> CO-INVENTOR'S NAME APR 22 2002 <hr/> Street Address <hr/> City, State and ZIP Code <hr/> <input type="checkbox"/> Check if additional changes are on reverse side
--	---

SERIES CODE/SERIAL NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
07/913,227	07/14/92	029	MAGLIONE, C	3306 04/01/94
Applicant LINDEN, BRADLEY C. INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD				

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
3 3570/113	604-053.000	W52	UTILITY	NO	\$1170.00	07/01/94

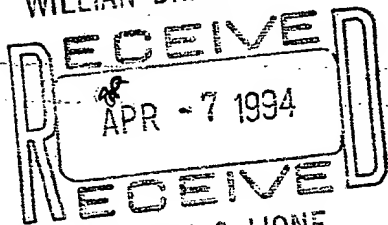
Further correspondence to be mailed to the following:	4. For printing on the patent front page, list the names of not more than 3 registered patent attorneys or agents OR alternatively, the name of a firm having as a member a registered attorney or agent. If no name is listed, no name will be printed. <div style="display: flex; justify-content: space-between;"> <div style="width: 80%;"> 1 _____ 2 _____ 3 _____ </div> <div style="width: 10%; text-align: center;"> 1 2 3 </div> </div>
---	--

DO NOT USE THIS SPACE

ASSIGNMENT DATA TO BE PRINTED ON THE PATENT (print or type) NAME OF ASSIGNEE: <hr/> ADDRESS: (City & State or Country) <hr/> STATE OF INCORPORATION, IF ASSIGNEE IS A CORPORATION <hr/> This application is NOT assigned. Assignment previously submitted to the Patent and Trademark Office. Assignment is being submitted under separate cover. Assignments should be directed to Box ASSIGNMENTS.	6a. The following fees are enclosed: <input type="checkbox"/> Issue Fee <input type="checkbox"/> Advanced Order - # of Copies _____ <div style="text-align: right;">(Minimum of 10)</div> 6b. The following fees should be charged to: DEPOSIT ACCOUNT NUMBER _____ (Enclose Part C) <input type="checkbox"/> Issue Fee <input type="checkbox"/> Advanced Order - # of Copies _____ <input type="checkbox"/> Any Deficiencies in Enclosed Fees (Minimum of 10)
EASE NOTE: Unless an assignee is identified in Block 5, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.	The COMMISSIONER OF PATENTS AND TRADEMARKS is requested to apply the Issue Fee to the application identified above. <div style="display: flex; justify-content: space-between;"> <div style="width: 70%;"> (Signature of party in interest of record) <hr/> </div> <div style="width: 20%;"> (Date) <hr/> </div> </div> NOTE: The Issue Fee will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the Patent and Trademark Office.

TRANSMIT THIS FORM WITH FEE-CERTIFICATE OF MAILING ON REVERSE

WILLIAM BRINKS HOFER



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: Box ISSUE FEE
COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APR 22 2002

GUSTAVO SELLER, JR.
WILLIAM BRINKS OLDS
HOFFER GILSON & LIONE LTD.
P.O. BOX 10395
CHICAGO, IL 60610

33M1/0401

NOTICE OF ALLOWANCE
AND ISSUE FEE DUE

The attached communication from the Examiner

is notice is issued in view of applicant's communication filed

SERIES CODE/SERIAL NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART. UNIT	DATE MAILED
07/913,227	07/14/92	029	MAGLIONE, C	3306 04/01/94
Applicant: LINDEN, BRADLEY C.				
OF INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD				

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
3 3570/113	604-053.000	W52	UTILITY	NO	\$1170.00	07/01/94

APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT.
SECUTION ON THE MERITS IS CLOSED.

ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS
APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

HOW TO RESPOND TO THIS NOTICE:

Review the SMALL ENTITY Status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

If the Status is changed, pay twice the amount of the FEE DUE shown above and notify the Patent and Trademark Office of the change in status, or

If the Status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:

A. Pay FEE DUE shown above, or

B. File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above:

Part B of this notice should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. If the ISSUE FEE has already been paid by a charge to deposit account, Part B should be completed and returned. If you are charging the ISSUE FEE to your deposit account, Part C of this notice should also be completed and returned.

All communications regarding this application must give series code (or filing date), serial number and batch number. Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees.

YOUR COPY

APR 22 2002

Status Of 3570/343 Claims After November '95 Amendment

1. (once amended) A method of treating a vessel having a vessel wall with an inner surface, the method comprising the steps of:

inserting a catheter having a vessel puncturing element disposed therein into a substantially tubular vessel;

positioning the puncturing element at the site in the vessel to be treated;

removing a restraint that holds said puncturing element in a retracted position, said puncturing element automatically moving in a direction substantially non-parallel with respect to a portion of said catheter that contains said puncturing element when said restraint is removed.

2. (once amended) The method of claim 31 wherein the step of delivering the drug comprises delivering the drug into the vessel wall.

3. (once amended) The method of claim 31 wherein the step of delivering the drug comprises delivering the drug to the outer surface of the vessel wall.

4. (once amended) The method of claim 31 wherein the step of delivering the drug comprises delivery of the drug into tissue surrounding the vessel wall.

5. (once amended) The method of claim 31 wherein the step of delivering the drug comprises the step of delivering a drug in a time release module.

6. (once amended) The method of claim 31 wherein the delivery means includes said puncturing element having a drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

7. (twice amended) A drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising:

an elongated catheter adapted to be inserted into the vessel;

said catheter comprising a puncturing element having a retracted position in which said puncturing element does not puncture said vessel wall, at least a portion of said puncturing element being housed in a portion of said catheter when said puncturing element is in said retracted position;

a restraint coupled to said catheter and holding said puncturing element in said retracted position;

said puncturing element further having a puncturing position in which said puncturing element engages and punctures said vessel wall, said puncturing element being substantially non-parallel with respect to said portion of said catheter when said puncturing element is in said puncturing position;

said puncturing element automatically moving from said retracted position to said puncturing position when said restraint is released; and

delivery means coupled to said catheter [for] and delivering a drug [outside the inner surface of the vessel wall] through a puncture in the vessel wall.

8. The device defined in Claim 7 wherein:

said puncturing element further comprises a puncturing tip for puncturing said vessel wall when said puncturing element is in said puncturing position; and

said catheter further comprises a window through which said puncturing tip extends when said puncturing element is in said puncturing position.

9. The device defined in Claim 7 wherein said catheter further comprises:

an inflatable balloon coupled to said catheter; and

an inflation lumen extending through said catheter for delivering inflation fluid to said balloon.

10. **(canceled)** The device defined in Claim 7 further comprising a coupling that moves said puncturing element from its retracted position to its puncturing position.

11.(canceled) The device defined in Claim 10 wherein said coupling also moves said puncturing element from its puncturing position to its retracted position.

12.(canceled) The device defined in Claim 11 further comprising a guide that guides said puncturing element to its retracted position.

13. The device defined in Claim 7 wherein:

said puncturing element further comprises an elongated shaft having a proximal and a distal end and an inner shaft lumen, and a needle, attached to said distal end of said shaft, having an inner needle lumen which is in fluid communication with said inner shaft lumen; and

said delivery means comprises said inner shaft lumen and said inner needle lumen.

14. The device defined in Claim 13 wherein said needle further comprises a puncturing tip for engaging and puncturing said vessel wall when said puncturing element is in said puncturing position.

15. The device defined in Claim 14 wherein said puncturing tip includes an opening in communication with said inner needle lumen so that fluid in said inner needle lumen can flow out of said tip opening.

16.(once amended) The [invention] device defined in Claim 15 wherein said delivery means further comprises an injection device coupled to said inner shaft lumen for injecting fluid through said inner shaft lumen.

17. The device defined in Claim 14 wherein said puncturing tip has a beveled edge for puncturing said vessel wall.

18. The device defined in Claim 7 wherein said puncturing element comprises a needle having a tip for puncturing said vessel wall..

19. The device defined in Claim 18 wherein:

said needle is bent into a substantially U-shape when said puncturing element is in said retracted position; and

said needle is extended out to form a predetermined angle when said needle is in said puncturing position.

20. The device defined in Claim 18 wherein:

said needle is bent to a first predetermined angle when said puncturing element is in said retracted position; and

said needle is extended out to form a second predetermined angle when said needle is in said puncturing position.

21. The device defined in Claim 18 wherein said needle is substantially parallel with said portion of said catheter when said needle is in said retracted position, said needle also being substantially non-parallel with said portion of said catheter when said needle is in said puncturing position.

22. The method of Claim 1 wherein said drug comprises an antiproliferative drug for the treatment of restenosis.

23. The method of Claim 1 wherein said drug comprises an antiproliferative drug for the treatment of vascular disease.

24. The method of Claim 1 wherein said drug comprises a specific inhibitor of cellular proliferation.

25. The method of Claim 1 wherein said drug comprises a specific inhibitor of thrombin.

26. The method of Claim 1 wherein said drug comprises a specific inhibitor of platelets.

27. The method of claim 1 wherein said drug comprises a genetic material.

28. The method of claim 1 wherein said drug comprises a genetic material that when incorporated into cells results in the expression of therapeutic materials.

29. The method of claim 1 wherein said drug is incorporated into a time released matrix.

30. The method of claim 1 further comprising the step of puncturing the vessel wall with the puncturing element at the site to be treated.

31. The method of claim 30 further comprising the step of delivering via a delivery means a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall.

32.(once amended) A method of treating a vessel having a vessel wall with an inner surface, the method comprising the steps of:

inserting a catheter having a vessel puncturing element disposed therein into a substantially tubular vessel;

positioning the puncturing element at the site in the vessel to be treated;

inflating an inflatable compartment adjacent said puncturing element to thereby [applying] apply an adjacent force adjacent said puncturing element to move said puncturing element in a direction substantially non-parallel with respect to a portion of said catheter that contains said puncturing element, said adjacent force moving said puncturing element from a retracted position to a puncturing position.

33.(once amended) The method of claim 32 further comprising the step of puncturing the vessel wall with the puncturing element [at the site to be treated with the puncturing element].

34. The method of claim 33 further comprising the step of delivering via a delivery means a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall.

35.(canceled) The method of claim 32 wherein said adjacent force is supplied by inflating an inflatable compartment adjacent said puncturing element.

36. The method of claim 35 wherein said compartment inflates a predetermined amount to move said puncturing element a predetermined distance.

37. The method of claim 34 wherein the step of delivering the drug comprises delivering the drug into the vessel wall.

38.(once amended) The method of claim [32] 34 wherein the step of applying said force moves said puncturing element a predetermined distance such that said drug is delivered to [the] an outer surface of the vessel wall.

39.(once amended) The method of claim [32] 34 wherein the step of delivering the drug comprises delivery of the drug into tissue surrounding the vessel wall.

40.(once amended) The method of claim [32] 34 wherein the step of delivering the drug comprises the step of delivering a drug in a time release module.

41.(once amended) The method of claim [32] 34 wherein the delivery means includes said puncturing element having a drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

42.(once amended) A drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising:

an elongated catheter adapted to be inserted into the vessel;
said catheter comprising a puncturing element having a retracted position in which said puncturing element does not puncture said vessel wall, at least a portion of said puncturing element being housed in a portion of said catheter when said puncturing element is in said retracted position;

said puncturing element further having a puncturing position in which said puncturing element engages and punctures said vessel wall, said puncturing element being substantially non-parallel with respect to said portion of said catheter when said puncturing element is in said puncturing position;

a movable surface comprising an inflatable compartment coupled to said catheter and adjacent said puncturing element to contact and move said puncturing element from said retracted position to said puncturing position when said movable surface is moved toward said puncturing element.

43.(once amended) The device of claim 42 wherein [said movable surface is part of an inflatable compartment, and] said movable surface is moved toward said puncturing element by inflating said inflatable compartment.

44. The device of claim 42 further comprising delivery means coupled to said catheter for delivering a drug outside the inner surface of the vessel wall through a puncture in the vessel wall.

45. The device defined in claim 44 wherein:

said puncturing element further comprises a puncturing tip for puncturing said vessel wall when said puncturing element is in said puncturing position; and

said catheter further comprises a window through which said puncturing tip extends when said puncturing element is in said puncturing position.

46. (once amended) The device defined in claim 44 wherein [said catheter further comprises]:

said inflatable compartment comprises an inflatable balloon [coupled to said catheter]; and

an inflation lumen [extending] extends through said catheter for delivering inflation fluid to said balloon.

47. The device defined in claim 44 wherein:

said puncturing element further comprises an elongated shaft having a proximal and a distal end and an inner shaft lumen, and a needle, attached to said distal end of said shaft, having an inner needle lumen which is in fluid communication with said inner shaft lumen; and

said delivery means comprises said inner shaft lumen and said inner needle lumen.

48. The device defined in claim 47 wherein said needle further comprises a puncturing tip for engaging and puncturing said vessel wall when said puncturing element is in said puncturing position.

49. The device defined in claim 48 wherein said puncturing tip includes an opening in communication with said inner needle lumen so that fluid in said inner needle lumen can flow out of said tip opening.

50. (once amended) The [invention] device defined in claim 49 wherein said delivery means further comprises an injection device coupled to said inner shaft lumen for injecting fluid through said inner shaft lumen.

51. The device defined in claim 50 wherein said puncturing tip has a beveled edge for puncturing said vessel wall.

52. The device defined in claim 42 wherein said puncturing element comprises a needle having a tip for puncturing said vessel wall.

53.(once amended) The [method] device of claim 44 wherein said drug comprises an antiproliferative drug for the treatment of restenosis.

54.(once amended) The [method] device of claim 44 wherein said drug comprises an antiproliferative drug for the treatment of vascular disease.

55.(once amended) The [method] device of claim 44 wherein said drug comprises a specific inhibitor of cellular proliferation.

56.(once amended) The [method] device of claim 44 wherein said drug comprises a specific inhibitor of thrombin.

57.(once amended) The [method] device of claim 44 wherein said drug comprises a specific inhibitor of platelets.

58.(once amended) The [method] device of claim 44 wherein said drug comprises a genetic material.

59.(once amended) The [method] device of claim 44 wherein said drug comprises a genetic material that when incorporated into cells results in the expression of therapeutic materials.

60.(once amended) The [method] device of claim 44 wherein said drug is incorporated into a time released matrix.

STATUS OF CLAIMS AFTER 1/29/96 AMENDMENT

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1. (twice amended) A method of treating a vessel having a vessel wall with an inner surface, the method comprising the steps of:

inserting a catheter having a vessel puncturing element disposed therein into a substantially tubular vessel;

positioning the puncturing element at the site in the vessel to be treated;

restraining said puncturing element such that it is maintained in a retracted position;

placing said puncturing element in a puncturing position in which said puncturing element is no longer restrained;

[removing a restraint that holds said puncturing element in a retracted position,]said puncturing element automatically moving in a direction substantially non-parallel with respect to a portion of said catheter that contains said puncturing element when said [restraint is removed] puncturing element is no longer being restrained.

2. (once amended) The method of claim 31 wherein the step of delivering the drug comprises delivering the drug into the vessel wall.

3. (once amended) The method of claim 31 wherein the step of delivering the drug comprises delivering the drug to the outer surface of the vessel wall.

4. (once amended) The method of claim 31 wherein the step of delivering the drug comprises delivery of the drug into tissue surrounding the vessel wall.

5. (once amended) The method of claim 31 wherein the step of delivering the drug comprises the step of delivering a drug in a time release module.

6. (once amended) The method of claim 31 wherein the delivery means includes said puncturing element having a drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

10. (canceled) The device defined in Claim 7 further comprising a coupling that moves said puncturing element from its retracted position to its puncturing position.

11. (canceled) The device defined in Claim 10 wherein said coupling also moves said puncturing element from its puncturing position to its retracted position.

12. (canceled) The device defined in Claim 11 further comprising a guide that guides said puncturing element to its retracted position.

13. The device defined in Claim 7 wherein:

said puncturing element further comprises an elongated shaft having a proximal and a distal end and an inner shaft lumen, and a needle, attached to said distal end of said shaft, having an inner needle lumen which is in fluid communication with said inner shaft lumen; and

said delivery means comprises said inner shaft lumen and said inner needle lumen.

14. The device defined in Claim 13 wherein said needle further comprises a puncturing tip for engaging and puncturing said vessel wall when said puncturing element is in said puncturing position.

15. The device defined in Claim 14 wherein said puncturing tip includes an opening in communication with said inner needle lumen so that fluid in said inner needle lumen can flow out of said tip opening.

16. (once amended) The [invention] device defined in Claim 15 wherein said delivery means further comprises an injection device coupled to said inner shaft lumen for injecting fluid through said inner shaft lumen.

17. The device defined in Claim 14 wherein said puncturing tip has a beveled edge for puncturing said vessel wall.

18. The device defined in Claim 7 wherein said puncturing element comprises a needle having a tip for puncturing said vessel wall.

19. The device defined in Claim 18 wherein:

said needle is bent into a substantially U-shape when said puncturing element is in said retracted position; and

said needle is extended out to form a predetermined angle when said needle is in said puncturing position.

20. The device defined in Claim 18 wherein:

said needle is bent to a first predetermined angle when said puncturing element is in said retracted position; and

said needle is extended out to form a second predetermined angle when said needle is in said puncturing position.

21. The device defined in Claim 18 wherein said needle is substantially parallel with said portion of said catheter when said needle is in said retracted position, said needle also being substantially non-parallel with said portion of said catheter when said needle is in said puncturing position.

22. The method of Claim 1 wherein said drug comprises an antiproliferative drug for the treatment of restenosis.

23. The method of Claim 1 wherein said drug comprises an antiproliferative drug for the treatment of vascular disease.

24. The method of Claim 1 wherein said drug comprises a specific inhibitor of cellular proliferation.

25. The method of Claim 1 wherein said drug comprises a specific inhibitor of thrombin.

26. The method of Claim 1 wherein said drug comprises a specific inhibitor of platelets.

27. The method of claim 1 wherein said drug comprises a genetic material.

28. The method of claim 1 wherein said drug comprises a genetic material that when incorporated into cells results in the expression of therapeutic materials.

29. The method of claim 1 wherein said drug is incorporated into a time released matrix.

30. The method of claim 1 further comprising the step of puncturing the vessel wall with the puncturing element at the site to be treated.

31. The method of claim 30 further comprising the step of delivering via a delivery means a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall.

32. (once amended) A method of treating a vessel having a vessel wall with an inner surface, the method comprising the steps of:

inserting a catheter having a vessel puncturing element disposed therein into a substantially tubular vessel;

positioning the puncturing element at the site in the vessel to be treated;

inflating an inflatable compartment adjacent said puncturing element to thereby [applying] apply an adjacent force adjacent said puncturing element to move said puncturing element in a direction substantially non-parallel with respect to a portion of said catheter that contains said puncturing element, said adjacent force moving said puncturing element from a retracted position to a puncturing position.

33. (once amended) The method of claim 32 further comprising the step of puncturing the vessel wall with the puncturing element [at the site to be treated with the puncturing element].

34. The method of claim 33 further comprising the step of delivering via a delivery means a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall.

35. (canceled) The method of claim 32 wherein said adjacent force is supplied by inflating an inflatable compartment adjacent said puncturing element.

36. (once amended) The method of claim [35] 32 wherein said compartment inflates a predetermined amount to move said puncturing element a predetermined distance.

37. The method of claim 34 wherein the step of delivering the drug comprises delivering the drug into the vessel wall.

38. (once amended) The method of claim [32] 34 wherein the step of applying said force moves said puncturing element a predetermined distance such that said drug is delivered to [the] an outer surface of the vessel wall.

39.(once amended) The method of claim [32] 34 wherein the step of delivering the drug comprises delivery of the drug into tissue surrounding the vessel wall.

40.(once amended) The method of claim [32] 34 wherein the step of delivering the drug comprises the step of delivering a drug in a time release module.

41.(once amended) The method of claim [32] 34 wherein the delivery means includes said puncturing element having a drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

42.(once amended) A drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising:

an elongated catheter adapted to be inserted into the vessel;
said catheter comprising a puncturing element having a retracted position in which said puncturing element does not puncture said vessel wall, at least a portion of said puncturing element being housed in a portion of said catheter when said puncturing element is in said retracted position;

said puncturing element further having a puncturing position in which said puncturing element engages and punctures said vessel wall, said puncturing element being substantially non-parallel with respect to said portion of said catheter when said puncturing element is in said puncturing position;

a movable surface comprising an inflatable compartment coupled to said catheter and adjacent said puncturing element to contact and move said puncturing element from said retracted position to said puncturing position when said movable surface is moved toward said puncturing element.

43.(once amended) The device of claim 42 wherein [said movable surface is part of an inflatable compartment, and] said movable surface is moved toward said puncturing element by inflating said inflatable compartment.

44. The device of claim 42 further comprising delivery means coupled to said catheter for delivering a drug outside the inner surface of the vessel wall through a puncture in the vessel wall.

45. The device defined in claim 44 wherein:

said puncturing element further comprises a puncturing tip for puncturing said vessel wall when said puncturing element is in said puncturing position; and

said catheter further comprises a window through which said puncturing tip extends when said puncturing element is in said puncturing position.

46. (once amended) The device defined in claim 44 wherein [said catheter further comprises]:

said inflatable compartment comprises an inflatable balloon [coupled to said catheter]; and

an inflation lumen [extending] extends through said catheter for delivering inflation fluid to said balloon.

47. The device defined in claim 44 wherein:

said puncturing element further comprises an elongated shaft having a proximal and a distal end and an inner shaft lumen, and a needle, attached to said distal end of said shaft, having an inner needle lumen which is in fluid communication with said inner shaft lumen; and

said delivery means comprises said inner shaft lumen and said inner needle lumen.

48. The device defined in claim 47 wherein said needle further comprises a puncturing tip for engaging and puncturing said vessel wall when said puncturing element is in said puncturing position.

49. The device defined in claim 48 wherein said puncturing tip includes an opening in communication with said inner needle lumen so that fluid in said inner needle lumen can flow out of said tip opening.

50. (once amended) The [invention] device defined in claim 49 wherein said delivery means further comprises an injection device

coupled to said inner shaft lumen for injecting fluid through said inner shaft lumen.

51. The device defined in claim 50 wherein said puncturing tip has a beveled edge for puncturing said vessel wall.

52. The device defined in claim 42 wherein said puncturing element comprises a needle having a tip for puncturing said vessel wall.

53.(once amended) The [method] device of claim 44 wherein said drug comprises an antiproliferative drug for the treatment of restenosis.

54.(once amended) The [method] device of claim 44 wherein said drug comprises an antiproliferative drug for the treatment of vascular disease.

55.(once amended) The [method] device of claim 44 wherein said drug comprises a specific inhibitor of cellular proliferation.

56.(once amended) The [method] device of claim 44 wherein said drug comprises a specific inhibitor of thrombin.

57.(once amended) The [method] device of claim 44 wherein said drug comprises a specific inhibitor of platelets.

58.(once amended) The [method] device of claim 44 wherein said drug comprises a genetic material.

59.(once amended) The [method] device of claim 44 wherein said drug comprises a genetic material that when incorporated into cells results in the expression of therapeutic materials.

60.(once amended) The [method] device of claim 44 wherein said drug is incorporated into a time released matrix.

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Status Of 3570/343 Claims After March '95 Preliminary Amendment

1.(once amended) A method of treating a vessel having a vessel wall with an inner surface, the method comprising the steps of:

inserting a catheter having a vessel puncturing element disposed therein into a substantially tubular vessel;

positioning the puncturing element at the site in the vessel to be treated;

removing a restraint that holds said puncturing element in a retracted position, [moving] said puncturing element automatically moving in a direction substantially non-parallel with respect to a portion of said catheter that contains said puncturing element when said restraint is removed [such that said puncturing element punctures the vessel wall at the site to be treated with the puncturing element; and

delivering via a delivery means a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall].

2.(once amended) The method of claim [1] 31 wherein the step of delivering the drug comprises delivering the drug into the vessel wall.

3.(once amended) The method of claim [1] 31 wherein the step of delivering the drug comprises delivering the drug to the outer surface of the vessel wall.

4.(once amended) The method of claim [1] 31 wherein the step of delivering the drug comprises delivery of the drug into tissue surrounding the vessel wall.

5.(once amended) The method of claim [1] 31 wherein the step of delivering the drug comprises the step of delivering a drug in a time release module.

6. (once amended) The method of claim [1] 31 wherein the delivery means includes said puncturing element having a drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

7. (once amended) A drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising:

an elongated catheter adapted to be inserted into the vessel;
said catheter comprising a puncturing element having a retracted position in which said puncturing element does not puncture said vessel wall, at least a portion of said puncturing element being housed in a portion of said catheter when said puncturing element is in said retracted position;

a restraint holding said puncturing element in said retracted position;

said puncturing element further having a puncturing position in which said puncturing element engages and punctures said vessel wall, said puncturing element being substantially non-parallel with respect to said portion of said catheter when said puncturing element is in said puncturing position;

said puncturing element automatically moving from said retracted position to said puncturing position when said restraint is released; and

delivery means coupled to said catheter for delivering a drug outside the inner surface of the vessel wall through a puncture in the vessel wall.

8. The device defined in Claim 7 wherein:

said puncturing element further comprises a puncturing tip for puncturing said vessel wall when said puncturing element is in said puncturing position; and

said catheter further comprises a window through which said puncturing tip extends when said puncturing element is in said puncturing position.

9. The device defined in Claim 7 wherein said catheter further comprises:

an inflatable balloon coupled to said catheter; and
an inflation lumen extending through said catheter for delivering inflation fluid to said balloon.

10. **(canceled)** The device defined in Claim 7 further comprising a coupling that moves said puncturing element from its retracted position to its puncturing position.

11. **(canceled)** The device defined in Claim 10 wherein said coupling also moves said puncturing element from its puncturing position to its retracted position.

12. **(canceled)** The device defined in Claim 11 further comprising a guide that guides said puncturing element to its retracted position.

13. The device defined in Claim 7 wherein:

said puncturing element further comprises an elongated shaft having a proximal and a distal end and an inner shaft lumen, and a needle, attached to said distal end of said shaft, having an inner needle lumen which is in fluid communication with said inner shaft lumen; and

said delivery means comprises said inner shaft lumen and said inner needle lumen.

14. The device defined in Claim 13 wherein said needle further comprises a puncturing tip for engaging and puncturing said vessel wall when said puncturing element is in said puncturing position.

15. The device defined in Claim 14 wherein said puncturing tip includes an opening in communication with said inner needle

lumen so that fluid in said inner needle lumen can flow out of said tip opening.

16. The invention defined in Claim 15 wherein said delivery means further comprises an injection device coupled to said inner shaft lumen for injecting fluid through said inner shaft lumen.

17. The device defined in Claim 14 wherein said puncturing tip has a beveled edge for puncturing said vessel wall.

18. The device defined in Claim 7 wherein said puncturing element comprises a needle having a tip for puncturing said vessel wall.

19. The device defined in Claim 18 wherein:
said needle is bent into a substantially U-shape when said puncturing element is in said retracted position; and
said needle is extended out to form a predetermined angle when said needle is in said puncturing position.

20. The device defined in Claim 18 wherein:
said needle is bent to a first predetermined angle when said puncturing element is in said retracted position; and
said needle is extended out to form a second predetermined angle when said needle is in said puncturing position.

21. The device defined in Claim 18 wherein said needle is substantially parallel with said portion of said catheter when said needle is in said retracted position, said needle also being substantially non-parallel with said portion of said catheter when said needle is in said puncturing position.

22. The method of Claim 1 wherein said drug comprises an antiproliferative drug for the treatment of restenosis.

23. The method of Claim 1 wherein said drug comprises an antiproliferative drug for the treatment of vascular disease.

24. The method of Claim 1 wherein said drug comprises a specific inhibitor of cellular proliferation.

25. The method of Claim 1 wherein said drug comprises a specific inhibitor of thrombin.

26. The method of Claim 1 wherein said drug comprises a specific inhibitor of platelets.

27. The method of claim 1 wherein said drug comprises a genetic material.

28. The method of claim 1 wherein said drug comprises a genetic material that when incorporated into cells results in the expression of therapeutic materials.

29. The method of claim 1 wherein said drug is incorporated into a time released matrix.

-- 30.(new) The method of claim 1 further comprising the step of puncturing the vessel wall with the puncturing element at the site to be treated. --

-- 31.(new) The method of claim 30 further comprising the step of delivering via a delivery means a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall.--

-- 32.(new) A method of treating a vessel having a vessel wall with an inner surface, the method comprising the steps of:
inserting a catheter having a vessel puncturing element disposed therein into a substantially tubular vessel;

positioning the puncturing element at the site in the vessel to be treated;

applying an adjacent force adjacent said puncturing element to move said puncturing element in a direction substantially non-parallel with respect to a portion of said catheter that contains said puncturing element, said adjacent force moving said puncturing element from a retracted position to a puncturing position.

-- 33.(new) The method of claim 32 further comprising the step of puncturing the vessel wall with the puncturing element at the site to be treated with the puncturing element. --

-- 34.(new) The method of claim 33 further comprising the step of delivering via a delivery means a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall.

-- 35.(new) The method of claim 32 wherein said adjacent force is supplied by inflating an inflatable compartment adjacent said puncturing element.--

-- 36.(new) The method of claim 35 wherein said compartment inflates a predetermined amount to move said puncturing element a predetermined distance. --

-- 37.(new) The method of claim 34 wherein the step of delivering the drug comprises delivering the drug into the vessel wall. --

-- 38.(new) The method of claim 32 wherein the step of applying said force moves said puncturing element a predetermined distance such that said drug is delivered to the outer surface of the vessel wall.--

-- 39.(new) The method of claim 32 wherein the step of delivering the drug comprises delivery of the drug into tissue surrounding the vessel wall.--

-- 40.(new) The method of claim 32 wherein the step of delivering the drug comprises the step of delivering a drug in a time release module.--

--41.(new) The method of claim 32 wherein the delivery means includes said puncturing element having a drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.--

--42.(new) A drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising:
an elongated catheter adapted to be inserted into the vessel;
said catheter comprising a puncturing element having a retracted position in which said puncturing element does not puncture said vessel wall, at least a portion of said puncturing element being housed in a portion of said catheter when said puncturing element is in said retracted position;

said puncturing element further having a puncturing position in which said puncturing element engages and punctures said vessel wall, said puncturing element being substantially non-parallel with respect to said portion of said catheter when said puncturing element is in said puncturing position;

a movable surface adjacent said puncturing element to contact and move said puncturing element from said retracted position to said puncturing position when said movable surface is moved toward said puncturing element.--

--43.(new) The device of claim 42 wherein said movable surface is part of an inflatable compartment, and said movable surface is moved toward said puncturing element by inflating said inflatable compartment.--

needle lumen so that fluid in said inner needle lumen can flow out of said tip opening.--

--50.(new) The invention defined in claim 49 wherein said delivery means further comprises an injection device coupled to said inner shaft lumen for injecting fluid through said inner shaft lumen.--

--51.(new) The device defined in claim 50 wherein said puncturing tip has a beveled edge for puncturing said vessel wall.--

-- 52.(new) The device defined in claim 42 wherein said puncturing element comprises a needle having a tip for puncturing said vessel wall.--

-- 53.(new) The method of claim 44 wherein said drug comprises an antiproliferative drug for the treatment of restenosis.--

-- 54.(new) The method of claim 44 wherein said drug comprises an antiproliferative drug for the treatment of vascular disease.--

-- 55.(new) The method of claim 44 wherein said drug comprises a specific inhibitor of cellular proliferation.--

-- 56.(new) The method of claim 44 wherein said drug comprises a specific inhibitor of thrombin.--

-- 57.(new) The method of claim 44 wherein said drug comprises a specific inhibitor of platelets.--

-- 58.(new) The method of claim 44 wherein said drug comprises a genetic material.--

--44.(new) The device of claim 42 further comprising delivery means coupled to said catheter for delivering a drug outside the inner surface of the vessel wall through a puncture in the vessel wall.--

--45.(new) The device defined in claim 44 wherein:
said puncturing element further comprises a puncturing tip for puncturing said vessel wall when said puncturing element is in said puncturing position; and
said catheter further comprises a window through which said puncturing tip extends when said puncturing element is in said puncturing position. --

--46.(new) The device defined in claim 44 wherein said catheter further comprises:
an inflatable balloon coupled to said catheter; and
an inflation lumen extending through said catheter for delivering inflation fluid to said balloon.--

--47.(new) The device defined in claim 44 wherein:
said puncturing element further comprises an elongated shaft having a proximal and a distal end and an inner shaft lumen, and a needle, attached to said distal end of said shaft, having an inner needle lumen which is in fluid communication with said inner shaft lumen; and
said delivery means comprises said inner shaft lumen and said inner needle lumen.--

--48.(new) The device defined in claim 47 wherein said needle further comprises a puncturing tip for engaging and puncturing said vessel wall when said puncturing element is in said puncturing position.--

--49.(new) The device defined in claim 48 wherein said puncturing tip includes an opening in communication with said inner

-- 59.(new) The method of claim 44 wherein said drug comprises a genetic material that when incorporated into cells results in the expression of therapeutic materials.--

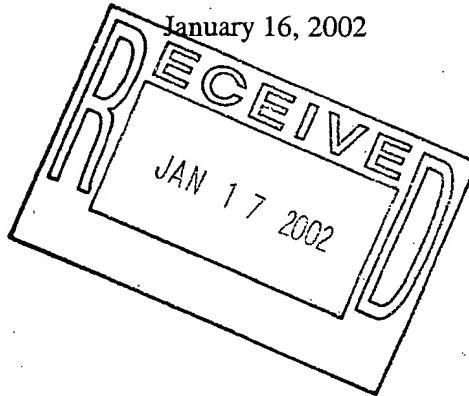
-- 60.(new) The method of claim 44 wherein said drug is incorporated into a time released matrix.--

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APR 22 2002

Re: US Patent Application No. 07/913,227
"Intra-Extravascular Drug Delivery Catheter and Method"
Your Reference Number: S13.12-0036
Our Reference Number: 92-P0224

Dear William:

Pursuant to our telephone conversation of today and your request of January 7, enclosed please find our file for the above-referenced patent application. Please copy what you need from the file and return it to us at your next earliest convenience.

Should you have any further questions, do not hesitate to contact us.

Sincerely yours,

Cathleen K. Dyer
Legal Assistant to
Scott T. Bluni

:ckd

Enclosures

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- U.S. Pat. 4,824,436 and 4,636,195

SCIMED

Method for Delivering Drugs
Extra Vascularly and
Device Therefor
6/30/92

Inventor:

Brad Linden
Don Palme

Date of Invention:

3/18/92

Law Firm:

Willian Brinks Olds

SciMed Idea File #

000156

Contents:

Initial Invention Disclosures
Summary Page
Technical Package

Pages 2 thru 11
Page 12
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Letter of Disclosure

Invention: A method for the site specific extravascular controlled release of therapeutic agents for the treatment of restenosis, thrombosis, and/or cardiovascular disease.

Abstract: This method involves the implantaion of a biodegradeable material in close proximity to the extravascular side of a coronary artery where the implant will remain and release its therapeutic agent over a period of time. This invention involves several specific points.

1. The controlled release device:

- A. The device can be a polymeric rod or spike loaded with drug, which can be implanted next to an area on the heart which is to be treated.
- B. The device can be an injection of microcapsules loaded with drug, which can be placed in close proximity to the area of interest on the heart.
- C. The device can be an emulsion of liposomes loaded with drug, which can be placed in close proximity to the area of interest.

2. The delivery system:

- A. The controlled release device can be delivered via a catheter based system.
- B. The drug delivery system can be delivered surgically.
- C. The drug delivery system can be delivered via a non-catheter based injection system.

3. The therapeutic agent:

A. The drug can be a, or any combination of:

- A.1. A Thrombolytic
- A.2. An Anti-thrombotic
- A.3. An Anti-proliferative
- A.4. An Anti-platelet
- A.5. A Protein
- A.6. A Peptide
- A.7. A fragment of a recombinant peptide/protein
- A.8. A fragment of a non-recombinant peptide/protein
- A.9. Genetic material
- A.10. A recombinant peptide/protein
- A.11. A non-recombinant peptide/protein
- A.12. A glycoprotein
- A.13. A fragment of a glycoprotein
- A.14. A recombinant glycoprotein
- A.15. A fragment of a recombinant glycoprotein
- A.16. A Carbohydrate or a fragment thereof
- A.17. An Antiarrhythmic
- A.18. A beta blocker
- A.19. A calcium channel blocker
- A.20. A vasodilator
- A.21. A vasoconstrictor
- A.22. An inorganic ion or mixture thereof

Inventor:

Donald F. Palmer II

Date: 3/18/92

Inventor:

Bruce C. Smith

Date: 3/18/92

Witness:
Robert A. Smith
3/20/92

Interventional Therapeutics Program

Devices for site specific drug delivery

ADDENDUM TO DISCLOSURE: EXTRAVASCULAR DRUG DELIVERY

This document describes additional ideas with respect to disclosure made in March 1992 by Brad Linden.

Extravascular drug delivery can provide ideal pharmacologic circumstances for the delivery and uptake of drugs. This is due to the fact that intravascluarly delivered drugs are diluted and whisked away by the blood before they have time to act on their target(s). When a drug is delivered peri-adventitially, it has the opportunity to remain in the vicinity of its delivery for sustained periods of time which allows the drug time to diffuse into the vessel from the outside. The obvious question is: How do we do it?

There are two possible approaches:

1. Approach from the outside of the vessel.
2. Approach from the inside of the vessel.

Approach 1:

The vessel can be approached from the outside via a "self-guiding" catheter which may be introduced into the thorax through a sub-xiphoid ventral incision approach, or a lateral or dorsal incision through the intercostal (between the ribs) muscles, whichever would be most advantageous to reach the coronary vessel or region of choice. This procedure could be performed under fluoroscopy using a balloon catheter placed at the PTCA site as a marker.

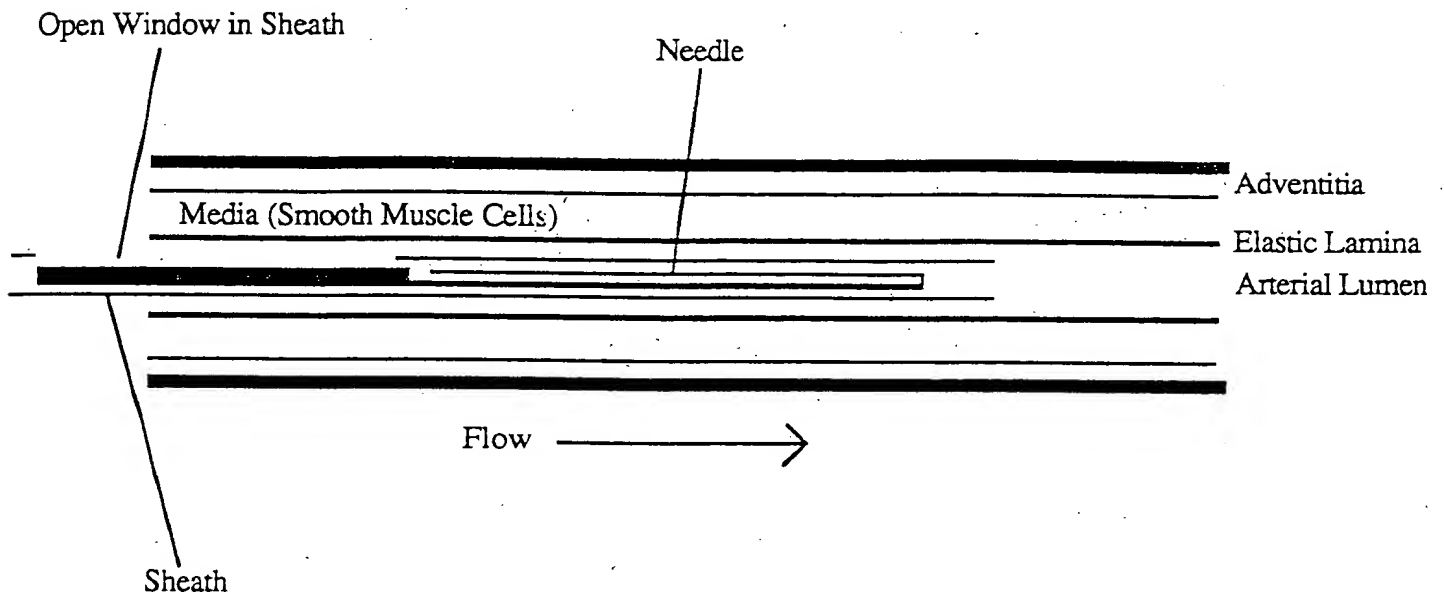
Approach 2:

The vessel can be approached from the inside and then gain access to the exterior of the vessel (intra-extravascular delivery).

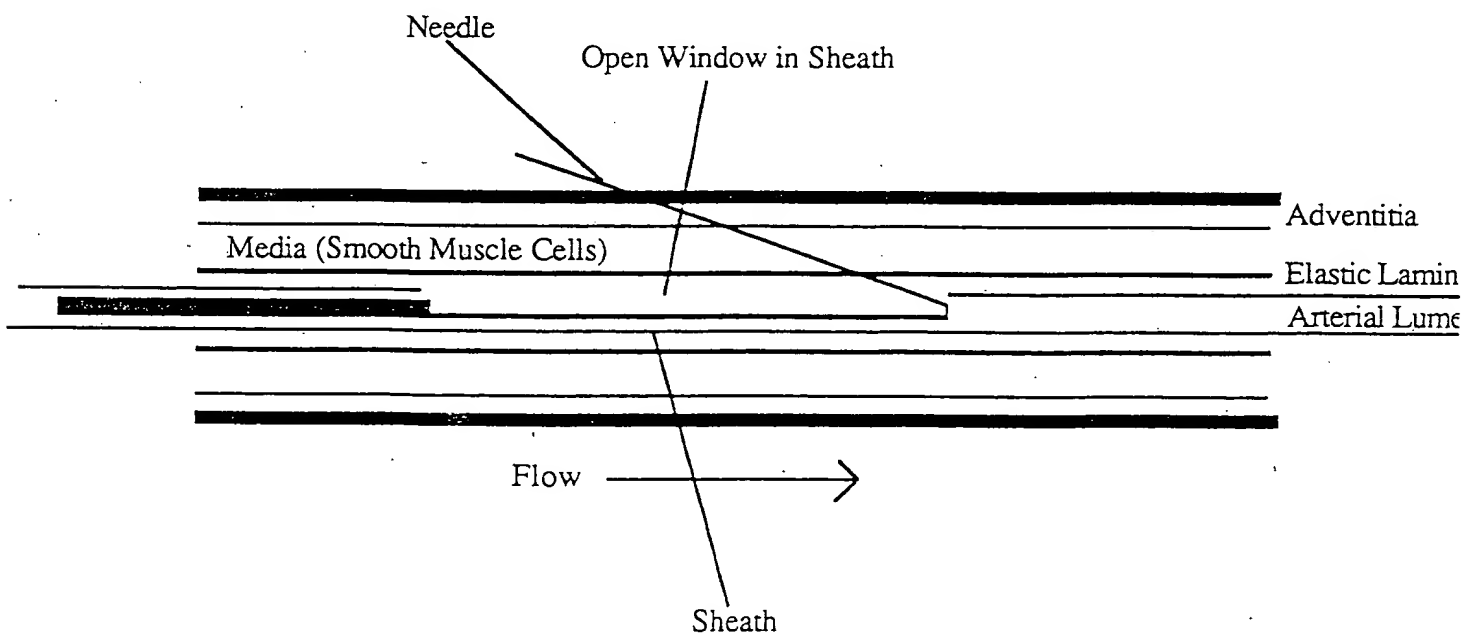
With the advent of some of the newer technologies it has become a relatively routine event to perforate an artery while performing one of these procedures. While this event is harrowing, it does not always spell CABG. I propose that an artery can be selectively and safely perforated with a small gauge needle, and that therapeutic agents can then be delivered to the peri-adventitial space. This can be achieved using a device as follows:

Interventional Therapeutics Program

Devices for site specific drug delivery



The device can be guided to a site under fluoroscopy using standard PTCA guiding catheter and guidewire techniques. The sheath can be advanced to place an open window over the radiopaque needle so the needle may be released and orient itself at an angle to the shaft with a certain degree of opening force. The catheter can then be pulled back to insert the needle into the vessel wall and exit on the adventitial side. Therapeutic agent can be infused over most any period of time because the device does not block flow. After the infusion is complete, the catheter can be pushed forward to remove the needle from the vessel wall, and the sheath can be pulled back to force the needle back into a position parallel to the catheter shaft.



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Devices for site specific drug delivery

The angled retrograde path of the needle protects the needle track from being filled with flowing blood and causing dissection, and allowing the track to clot closed.

Visualization can be aided by the use of various radiopaque parts.

Guidance of the needle can be monitored by incorporating intravascular ultrasound into the device to determine when the adventitia has been reached.

Other Therapeutic Uses:

This device could be used for the treatment of various disorders involving vessel-like lumens in the body, such as prostatitis, the delivery of cancer chemotherapeutics, and the site specific delivery of controlled release antibiotics for the treatment of pericarditis.

Inventor

Bradley C. Smith

Date

6/16/97

Witness

[Signature]

Date

6/16/97

Interventional Therapeutics Program

Devices for site specific drug delivery

**Addendum to Extravascular
Drug Delivery Disclosure****Bradley C. Linden****6/28/92**

The device can have needles of various:

1. Sizes - IDs from less than .001 inches and ODs from smaller than 36 gauge.

2. Lumen shapes - The lumen of the needle may not only be round, but other shapes which may effect the performance of the device. Therefore, the lumen may be:

1. Oval
2. Rhomboid
3. Trapazoidal
4. Triangular
5. Round
6. Rectangular

3. Needle shapes - The needle may have intricate shapes which enable the device perform optimally.

4. Cuts - The cut at the end of the needle can optimize performance of the device, patterns can be formed on the sharpened end of the needle to optimize is properties.

DEVICE DESIGNS:

Design1: The device can be comprised of:

1. A multiple lumen tube, one of which serves as a guidewire lumen which is in communication with a port on the manifold, and another (one or more) serves to house the "Delivery apparatus".

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Devices for site specific drug delivery

2. A manifold which is comprised of:
 - a. An external body having a port for the introduction of a guidewire which communicates with the guidewire lumen through the length of the device, and a "locking mechanism" which operates via a "cam" action to immobilize an "actuator".
 - b. A "Actuator" which is in communication with the "delivery apparatus" in such a way that a solution can be infused through a fitting part of the actuator, and that fluid can then flow through a lumen or lumens of the "delivery apparatus" exiting out the needle/s.
 3. An inflatable balloon can be incorporated into the device to enable the controlled placement/penetration of the needle/s.
 4. The position of the components of the device can be monitored under fluoroscopy with the aid of marker bands or other means to denote the position of the various components of the device with respect to one another and or other components used in the procedure.
-
5. The "delivery apparatus" can be comprised of:
 - a. A single needle or a multitude of needles
 - b. Needles composed of:
 - Spring steel
 - Stainless steel
 - Titanium
 - Nitenol
 - A polymer or copolymer
 - Any combination of the above
 - c. Hypotubes composed of:
 - Spring steel
 - Stainless steel
 - Titanium
 - Nitenol

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Devices for site specific drug delivery

A polymer or copolymer
Any combination of the above

6. A balloon can be part of the device, located either proximal to, distal to, or at to the needle section. This balloon can serve as a means for inducing haemostasis at the site of puncture, or it may be used for dilatation before, during, or after the drug delivery, or the balloon can be used to perform a PTCA or PTCA-like procedure.

7. The device can be coated with a material that will make it detectable (or more so) by intravascular ultrasound. The location of the components of the delivery apparatus can then be determined with respect to one another via the use of a separate intravascular ultrasound probe, or a probe which is a component of the device itself. This will allow the user to monitor the position of the needle as it enters its target site.

8. The device can be coated with a material that will enable or enhance its visualization by:

MRI
CT scan
X-Ray
Gamma camera imaging
PET scan

METHOD:

This device can be used to treat:

Pulmonary sites
Genitourinary sites
Cardiovascular sites
Gastrointestinal sites
Cerebral sites
Peritoneal sites
Ophthalmic sites

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Devices for site specific drug delivery

Pancreatic sites
Hepatic sites
Skeletal muscle, connective tissues, and bone sites
Nervous system sites
Thrombus
Plaque
Different regions of the vessel wall
Dissections
Vessel wall/body lumen or cavity abnormalities (ie aneurisms)

The device can be used to place drug impregnated polymer in various configurations (such as a rod) at a site.

The needle/s or a conductor can be heated or cooled to enhance the performance of the device.

The needle/s or a conductor can be made to vibrate at various frequencies to enhance the performance of the device (ie optimize drug delivery).

The delivery apparatus can have a means for the conduction, transfer, or passage of light-energy which is, or is not an intimate part of the "needle" or any other part of the device.

The device can be used to deliver any wavelength of light to a specific portion of the lumen or body cavity of choice.

The device can be used to deliver any wavelength of light to a specific portion of the vessel wall.

The device can be used to deliver any wavelength of light to a specific portion of the adventitia.

The device can be used to deliver and activate light activated drugs.

The device can be used to deliver and activate heat/cold activated drugs.

Interventional Therapeutics Program

Devices for site specific drug delivery

The device can be used to deliver and activate sonically activated drugs.

The device can be used to deliver a substance which will carry the energy of light through wavelenth and/or energy transitions.

The device can be used to deliver a substance which will carry energy through wavelenth and/or energy transitions.

The device can be used to deliver and activate electrically activated drugs.

The device can have selectively or non-selectively magnetized elements.

The device can be used to induce an electric charge in an area.

The device can be used to induce a magnetic field in an area.

The device can be used to deliver perfluorocarbon (or any oxygen carrying compound) compounds for the treatment of cardiac or non-cardiac ischemia.

The device can deliver a matrix to the exterior of a body lumen or cavity to structurally reinforce the area, drug can be impregnated in this matrix and delivered coincidently.

The device can be used to deliver a material that can be hardened in the wall or on the adventitial side to be used as an extravascular stent.

The device can be used to deliver a material that can be hardened in the wall or on the adventitial side to be used as an intravascular stent.

The device can be used to remove things or substances.

A vacuum can be placed in the delivery apparatus (microsuction).

Bradley C. Kline

6/30/92

WSS: Don A. V. B. S.

6/30/92

Summary Page:

IT IS EXTREMELY IMPORTANT FOR US TO NOTE THAT THERE IS INTENT FOR SCIMED TO PUBLICLY DISCLOSE THIS IDEA ON JULY 1, 1992. (THIS DISCLOSURE IS BY TOM HEKTNER, AND MAY OR MAY NOT BE DONE CONFIDENTIALLY.)

Intent:

A method for the site specific extra vascular controlled release of therapeutic agents for the treatment of restenosis, thrombosis, and/or cardiovascular disease. More specifically, one embodiment is the use of an implantible biodegradable material for a timed release of the therapeutic agent. Another embodiment is the use of a intra-extra vascular delivery device, where there is a device in the blood vessel that can access the exterior of the vessel through some mechanical means (i.e. puncturing the wall of the vessel with a tiny needle).

NOTE: This device could be used for the delivery of any therapeutic agent....whether controlled release or not.

Areas of Novelty:

- the device itself
- external delivery via an internal catheter
- device that does not occlude blood flow during delivery
- low profile delivery device

Try to go for:

~~Broad claims on the METHOD of extra vascular drug delivery.~~

Broad claims on the METHOD of going from the inside to the outside of a vessel to deliver drugs.

Device claims on the intra-extra vascular device.

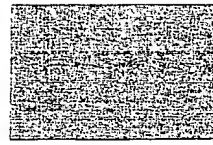
Claims on a drug delivery device that does not occlude flow during drug delivery

Prior Art Summary:

Doing a quick search in house on the dialog database service, and using the keywords listed below, here is what we found to be of potential relevance:

Keywords:	Drug	Vascular	Deliver
	Therapeutic	Artery	Dispense
	Outside	Lumen	Extra
	Extravascular	peri-adventitial	perforate
	puncture		

Results: Nothing Found



VIA FEDERAL EXPRESS

June 30, 1992

APR 22 2002

Gustavo Siller, Jr., Esq.
William Brinks Olds Hofer
Gilson & Lione
NBC Tower
455 North Cityfront Plaza Drive
Suite 3600
Chicago, IL 60611-5599

Re: New Disclosure on Drug Delivery Concept

Dear Gus:

Attached is a disclosure package on a new extra vascular drug delivery concept. The inventor is Brad Linden.

SCIMED has deemed this high priority, and we would like to see a search started immediately. We would like to see a draft on this invention by August 1, and we are shooting for a September 1 filing date.

My involvement in this matter is only to specify priority, to help out when necessary, and to monitor progress.

Please direct all correspondence regarding this idea to Brad Linden, Pat Stromberg and myself. If you have any questions, please direct them towards Brad Linden at x0564. If there is anything that I can help with, please feel free to ask. Thank you in advance for all of your help.

Sincerely,

SCIMED LIFE SYSTEMS, INC.

David A. VandenEinde
Patent Engineer
THE PTR GROUP

DAV/ps
Enclosures

Restenosis Summit 1992

POLYMER STENTS

Speaker: Gershon Golomb, PH.D.

Syllabus:

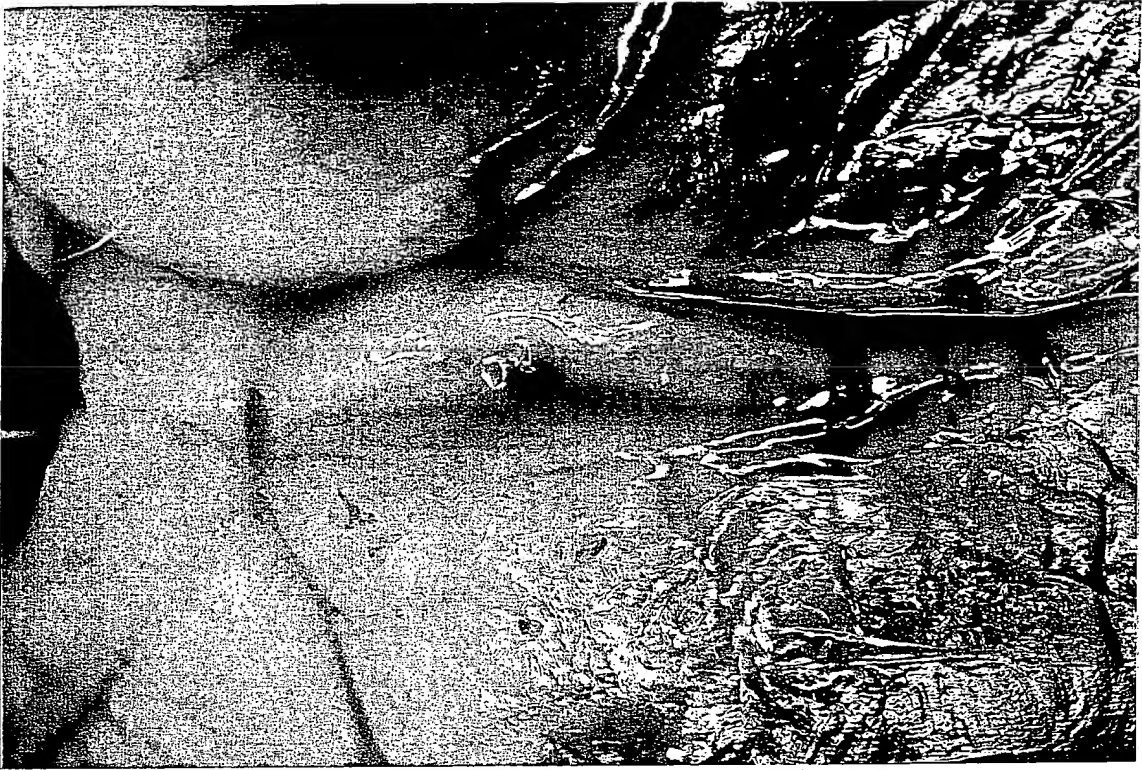
STRATEGIES FOR TREATING ARTERIAL RESTENOSIS
USING POLYMERIC CONTROLLED RELEASE IMPLANTS

Robert J. Levy¹, Gershon Golomb², Joseph Trachy¹
Vinod Labhasetwar¹, David Muller¹, and Eric Topol³

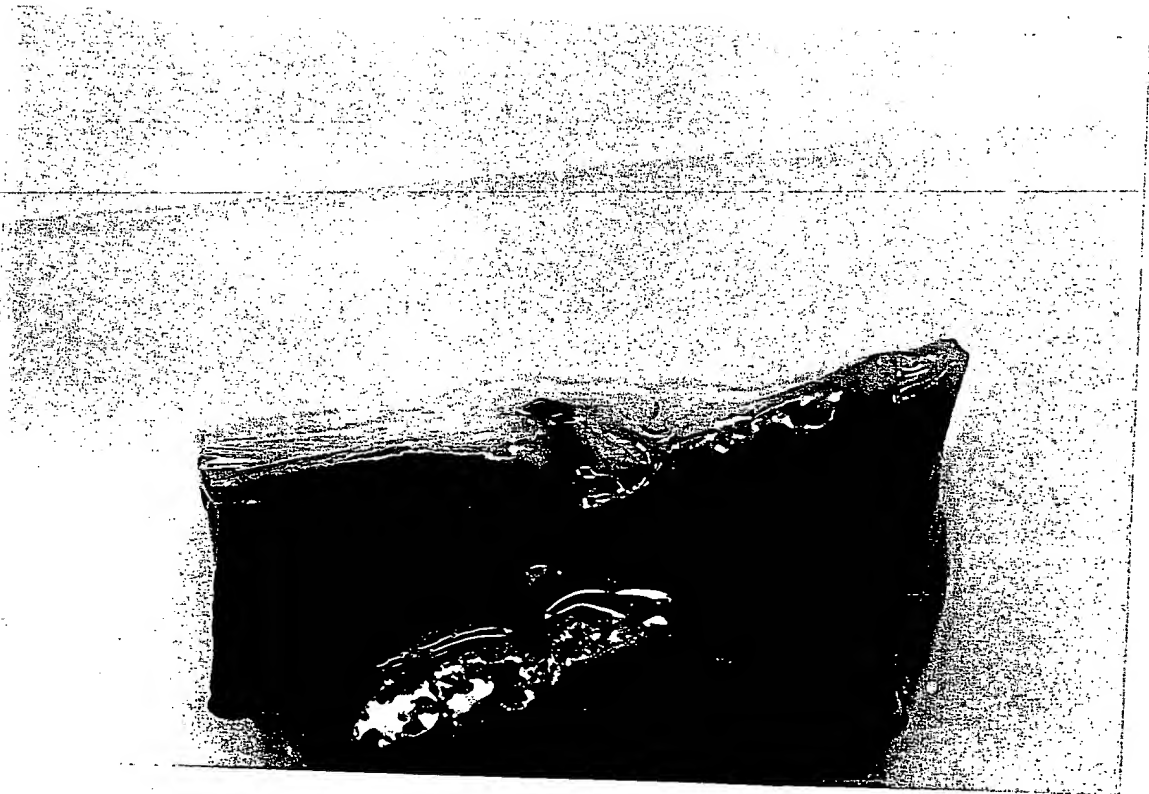
[In Press, Biotechnology and Bioactive Polymers,
ed. C. G. Gebelein, Plenum, N.Y.]

All of the above clinical strategies have also been investigated in various animal studies, which have indicated some preliminary benefit. Most recently, studies by Edelman and his colleagues, have demonstrated that periarterial drug administration using heparin-ethylen vinyl acetate composites significantly inhibited restenosis in a rat arterial injury model.^{11,12} This initial success of a controlled release drug delivery approach to restenosis has stimulated interest in the field. Controlled release drug implants have been used by our group and others to treat a variety of cardiovascular diseases, and this approach is uniquely suited for this general group of disorders.¹³ Controlled release may be defined as formulations of drug polymer composites, either as monolithic matrices or reservoirs with rate limiting membrane configurations, in which drug administration can be sustained through the use of polymeric materials. Implantation of controlled release polymer systems at the site of a cardiovascular disease process offers the advantages of regional high levels of drug, with optimal drug action, as well as lowering systemic drug exposure, and thereby minimizing the possibility of side effects.

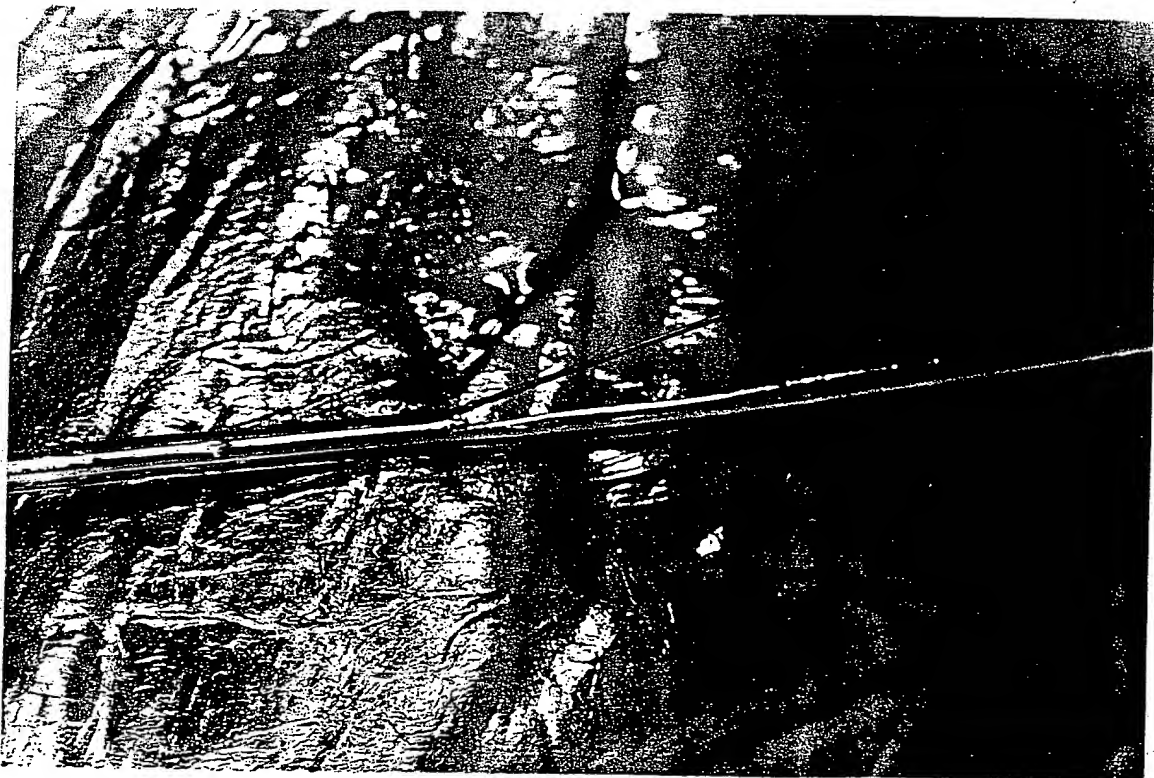
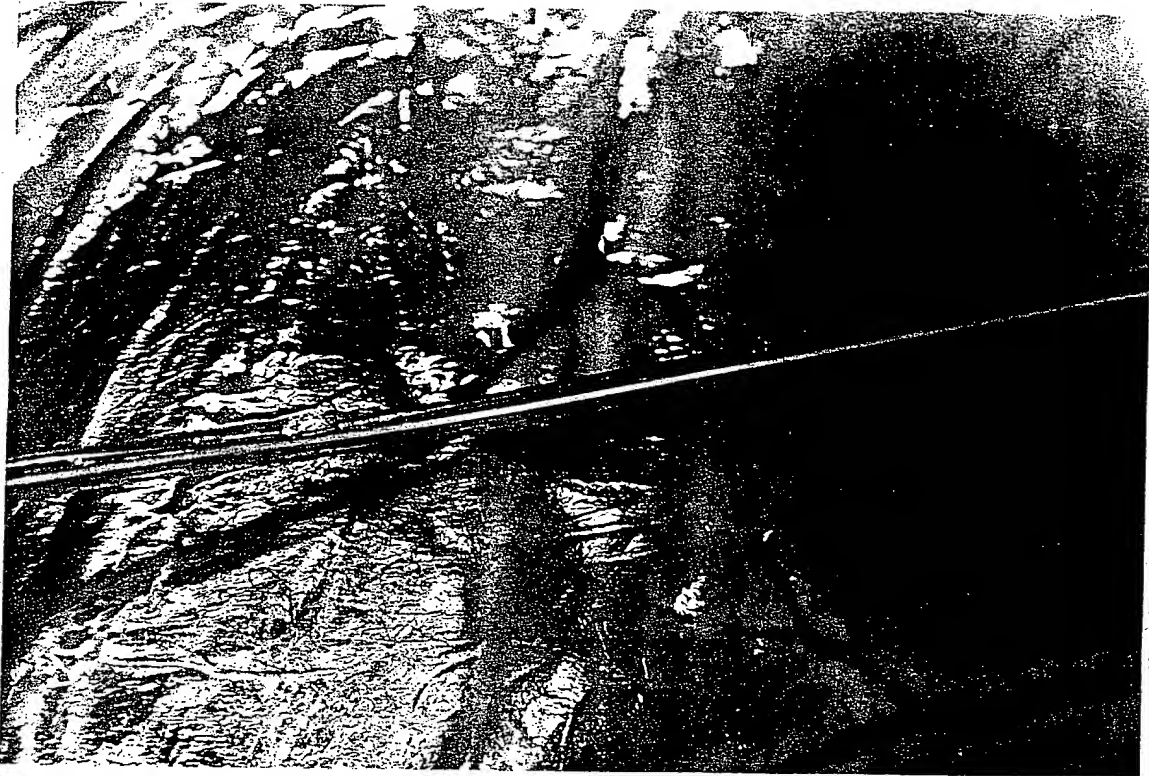


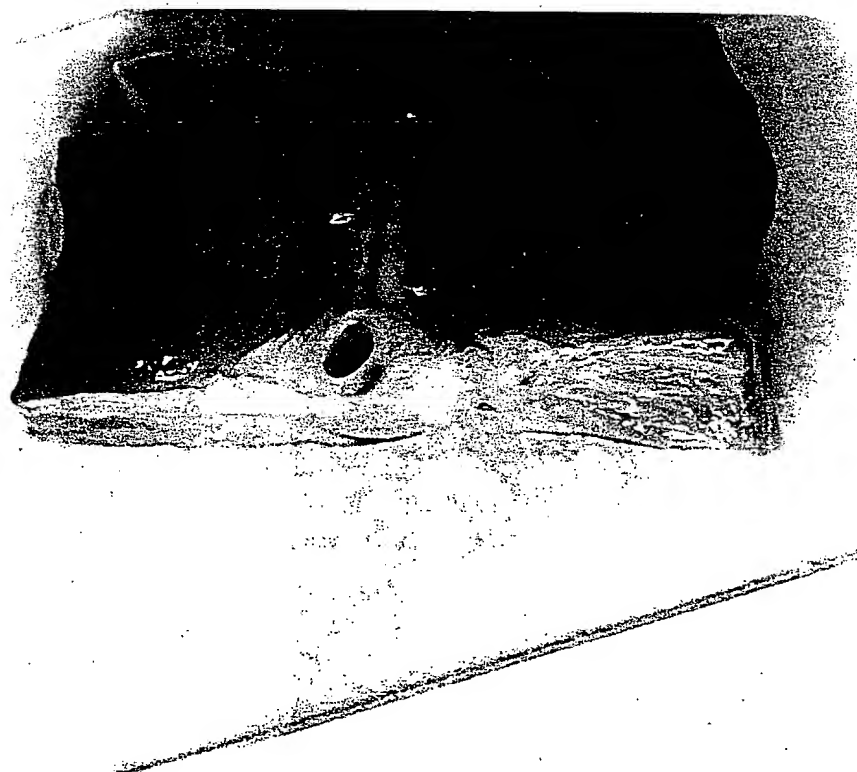
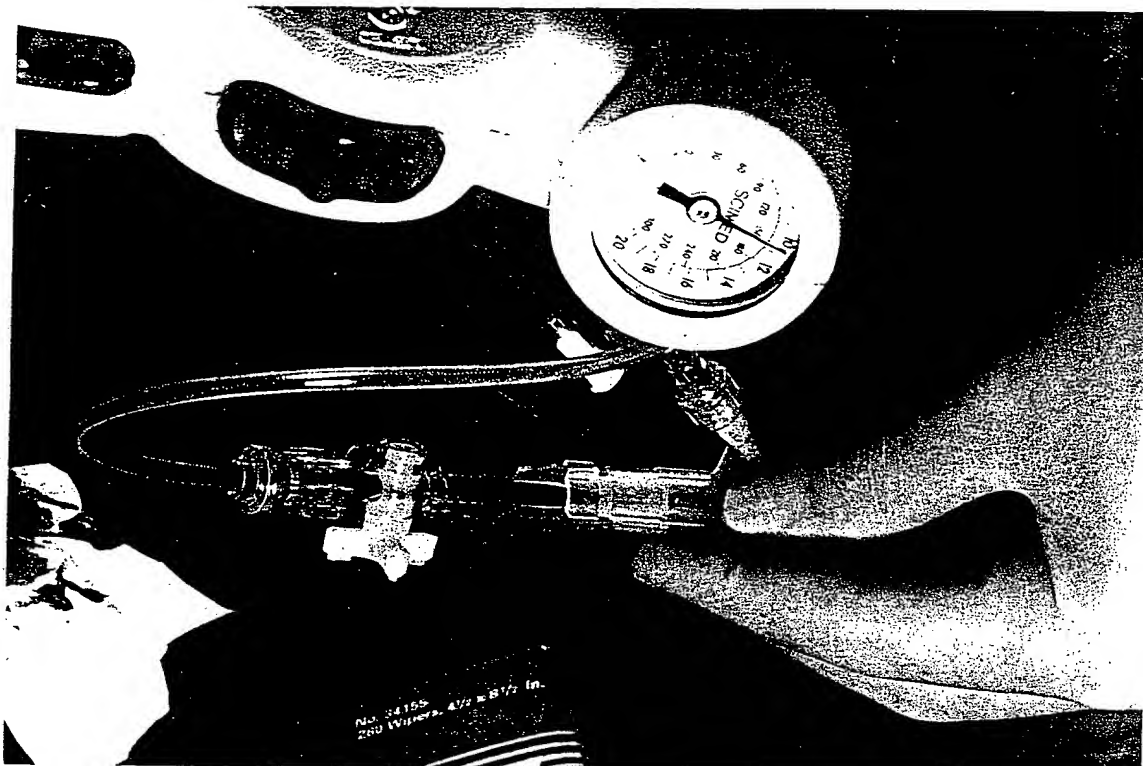


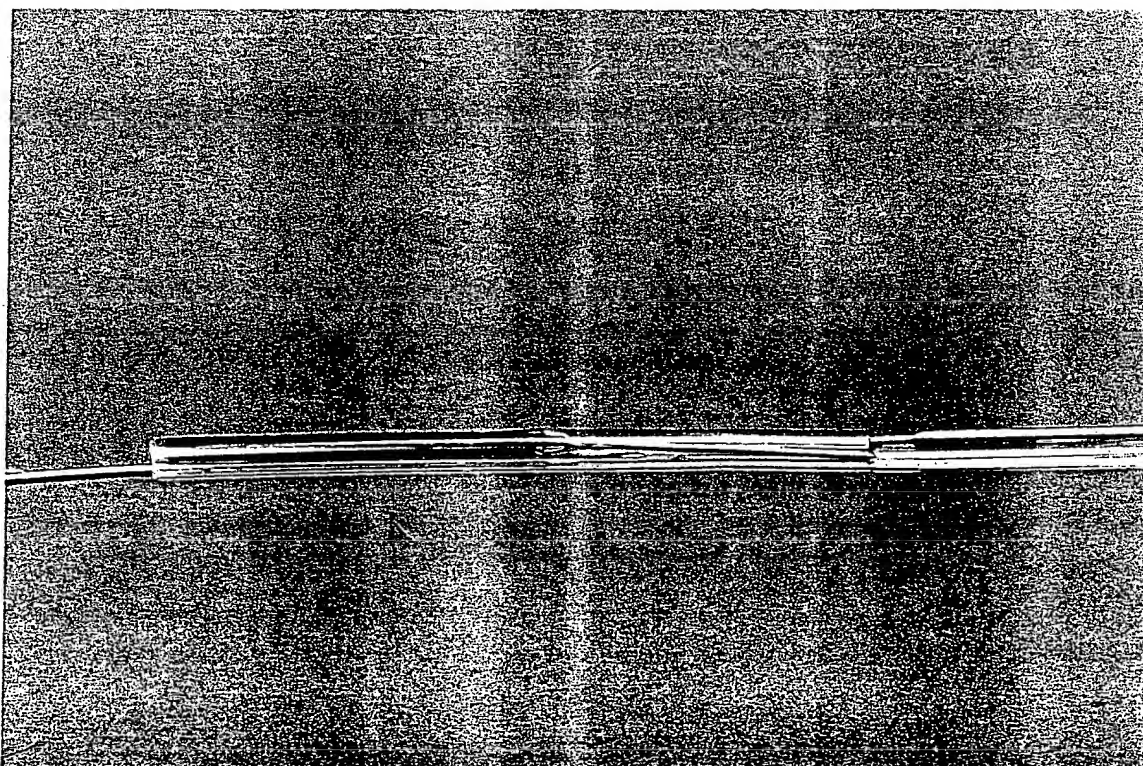
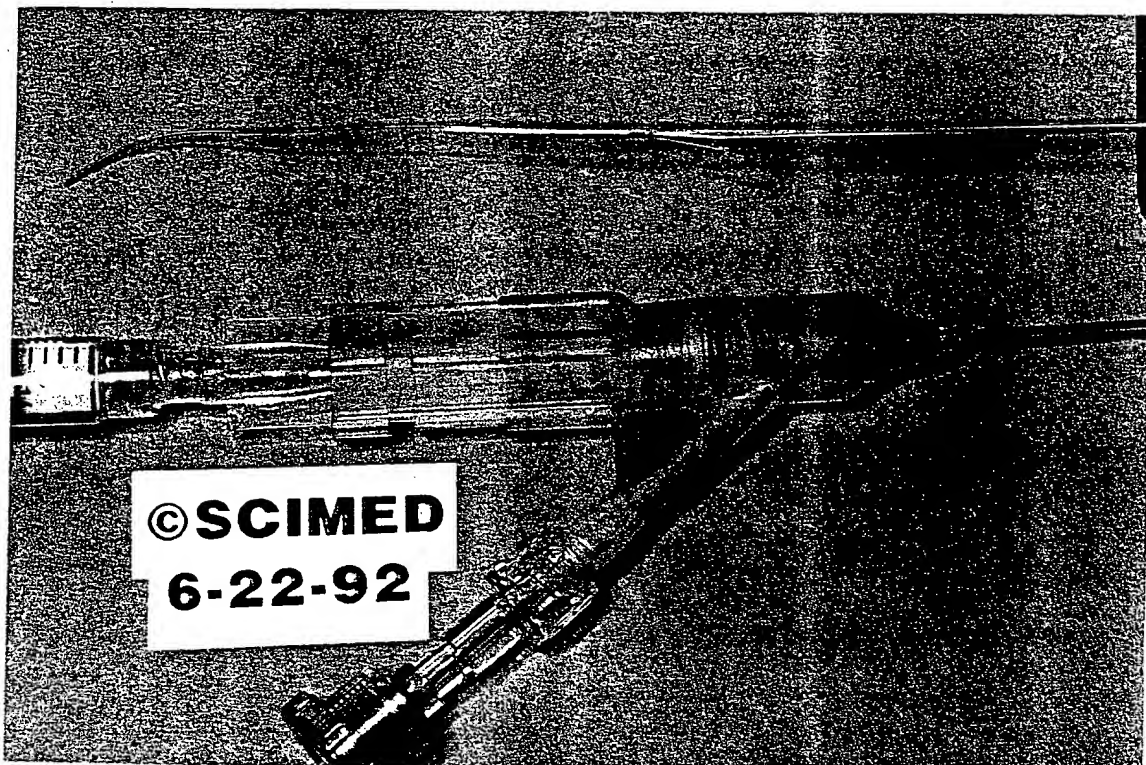


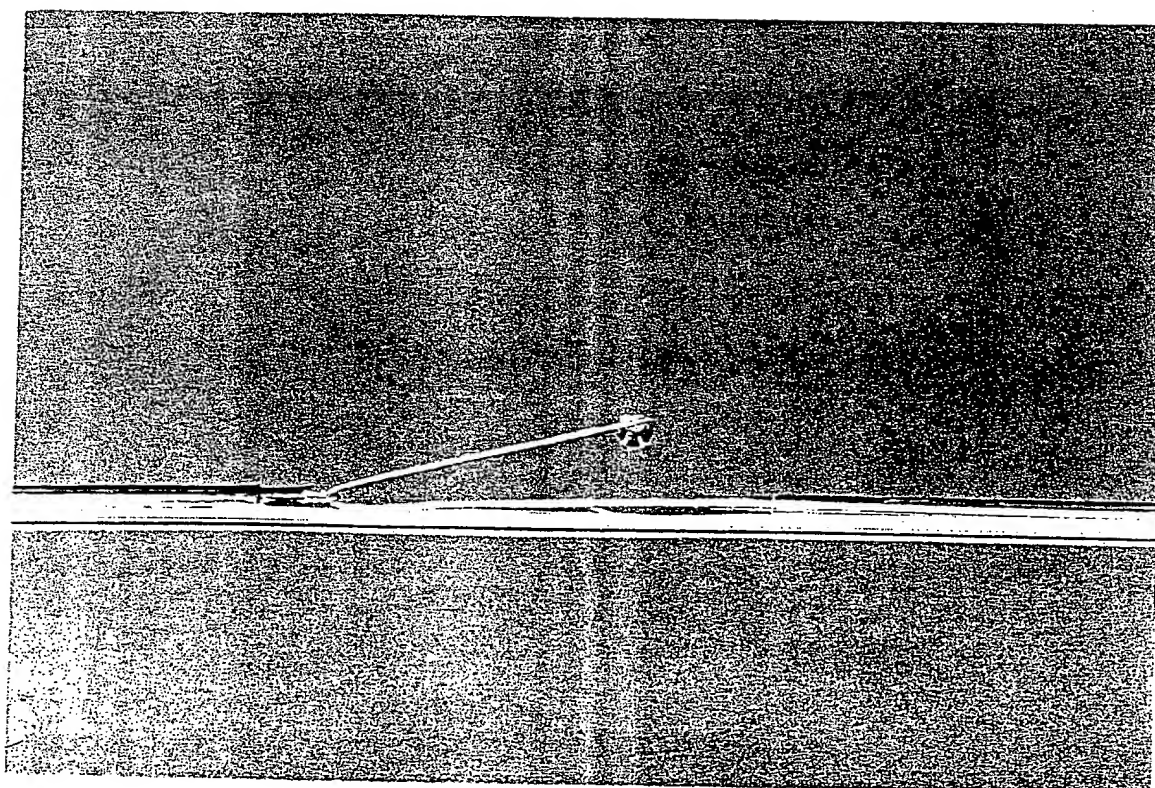
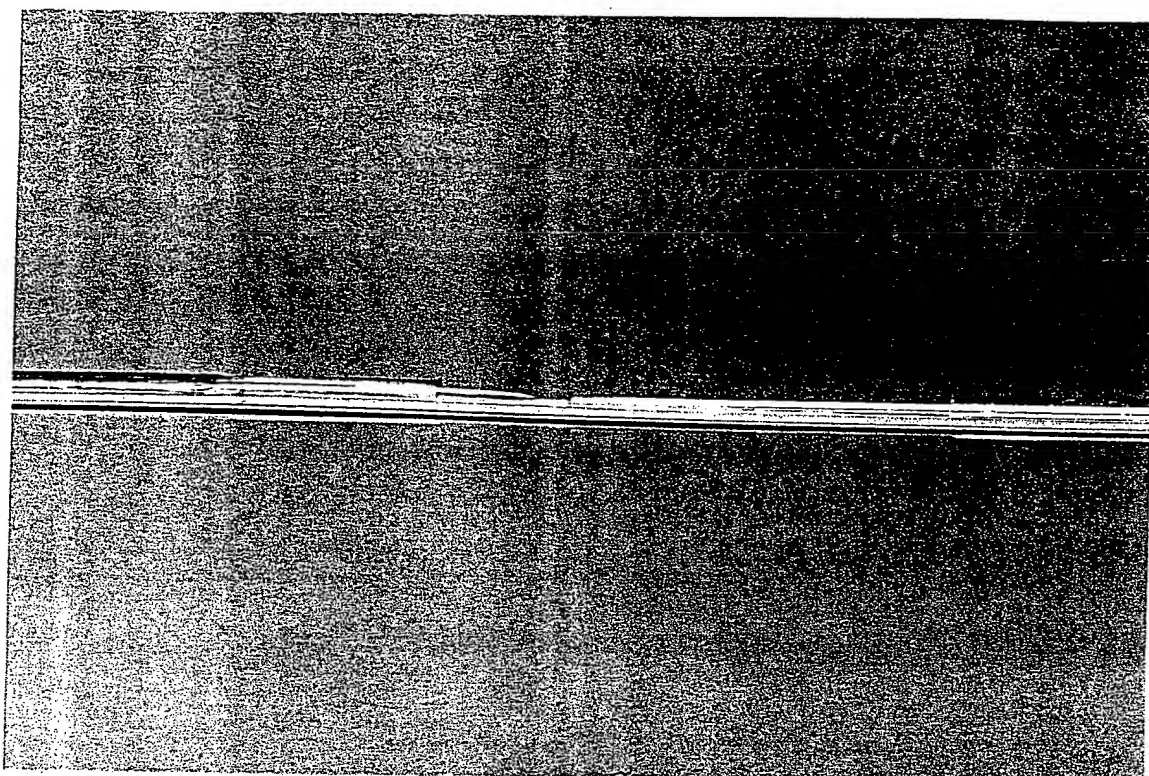


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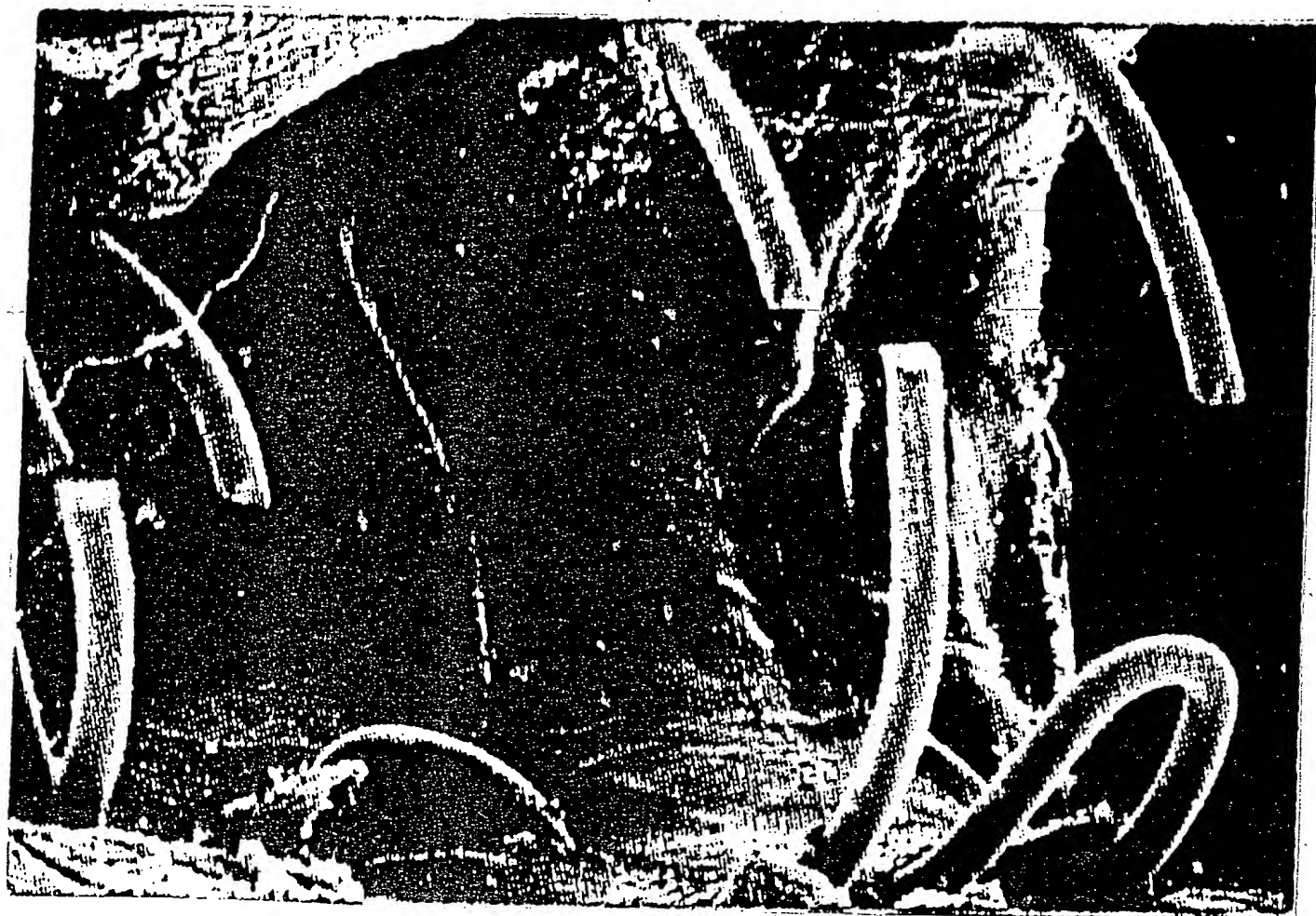


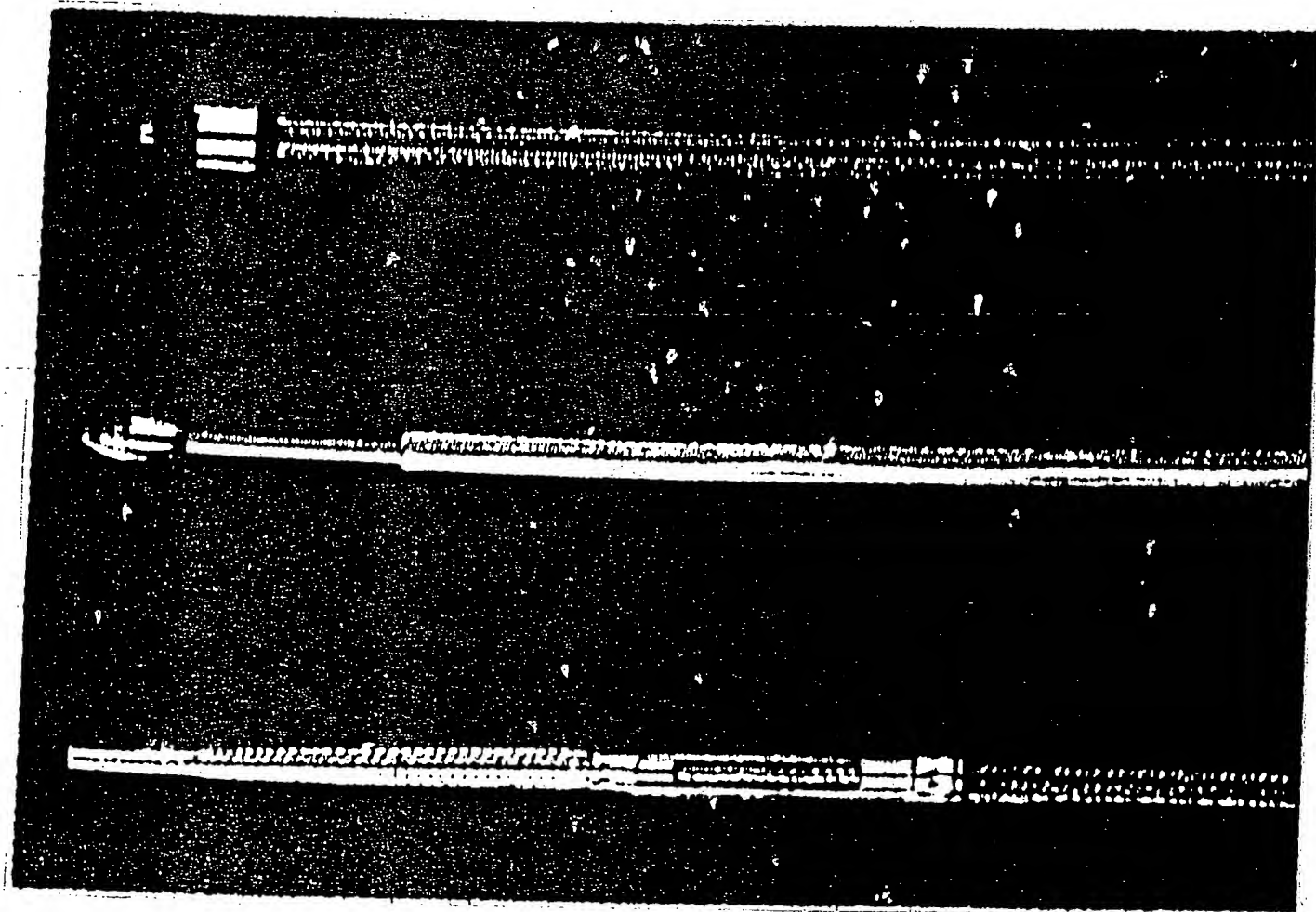


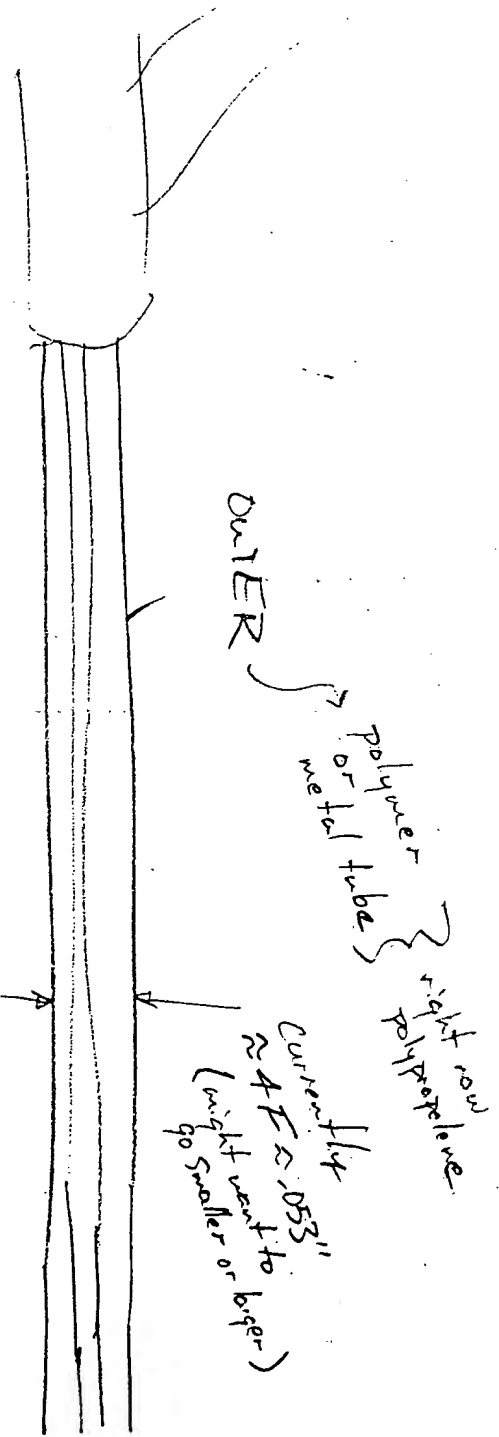




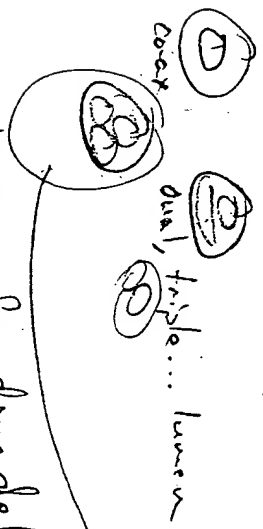
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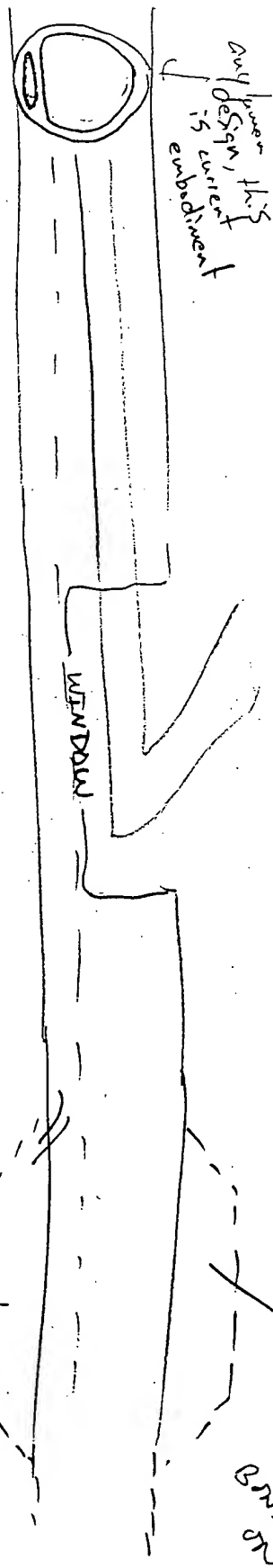


10
3 channels w/ 1st lumen
normal 25/30 gauge



- lumen for drug delivery
- lumen for guide wire
- could be a 3rd for a balloon...

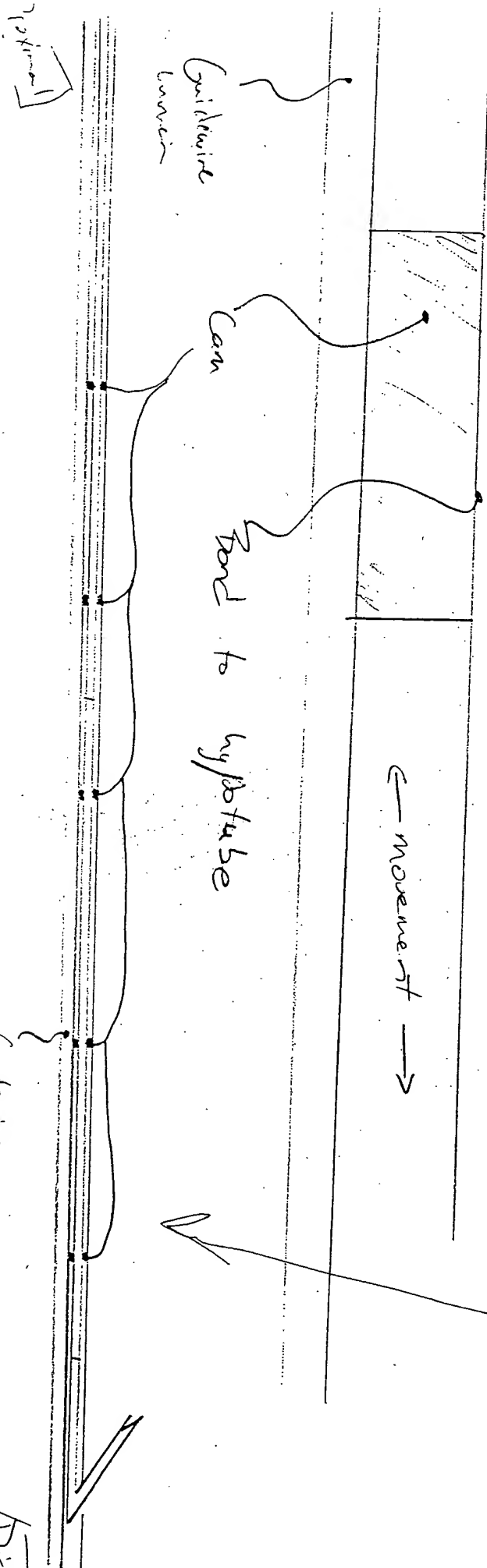
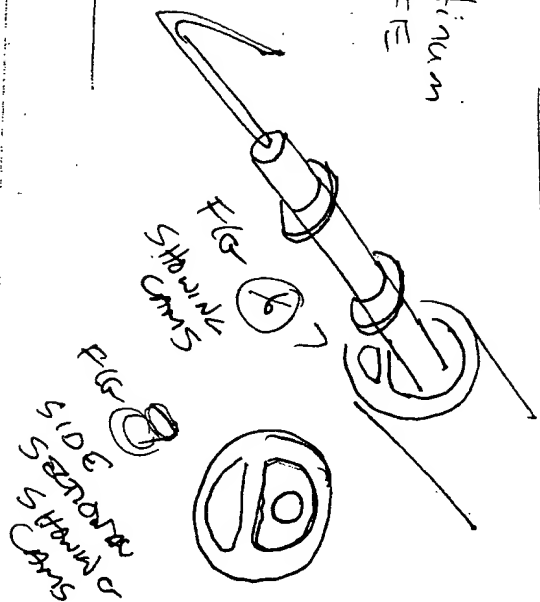
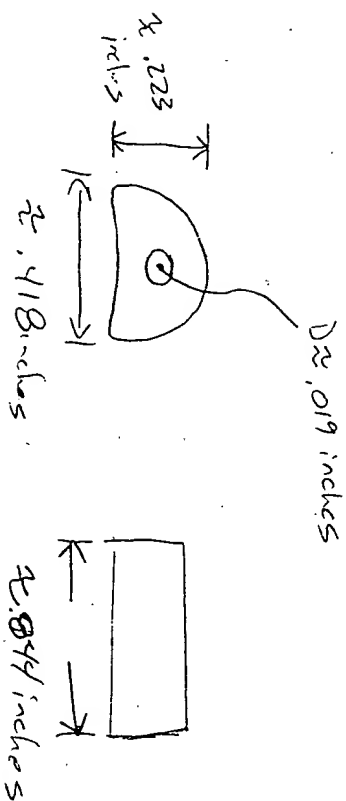
any lumen this design is current is embolism



→ drug delivery tube goes in one of these lumens (free longitudinal motion)

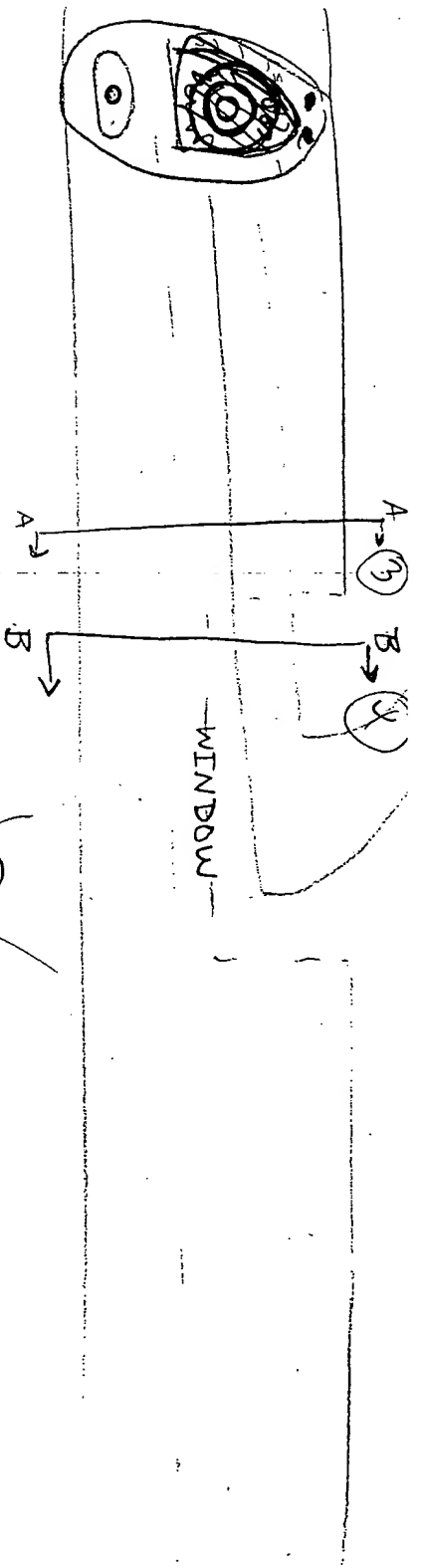
- could be made of
- polyimide tubing
- nitinol
- polycarbonate
- as a combination

Anti-Rotation Cams

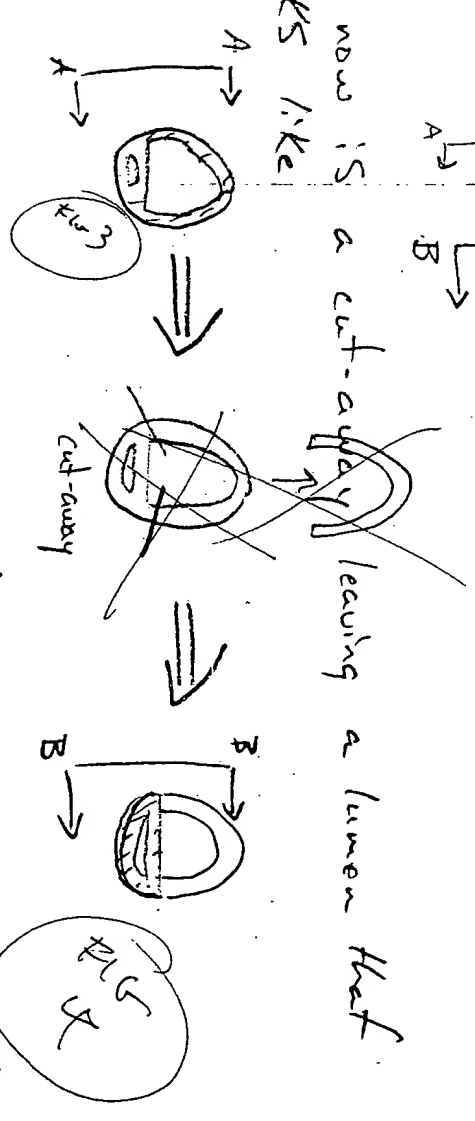


Purpose: Visualization on Fluoro, and allows for a predictable exit point

Distal



WINDOW: - right now is a cut-away leaving a lumen that looks like



- optimal length for the window is 3mm long (currently)
- optimal window location would be determined by the use of the device (ie. in coronary would like to be w/in 20mm of distal tip, in peripheral --- ???)

Puncture device / drug delivery tube:

- size ranges (from 0.0005 on up to 0.050")
- materials noted on other page

Multiple communicating
hydrostatic materials

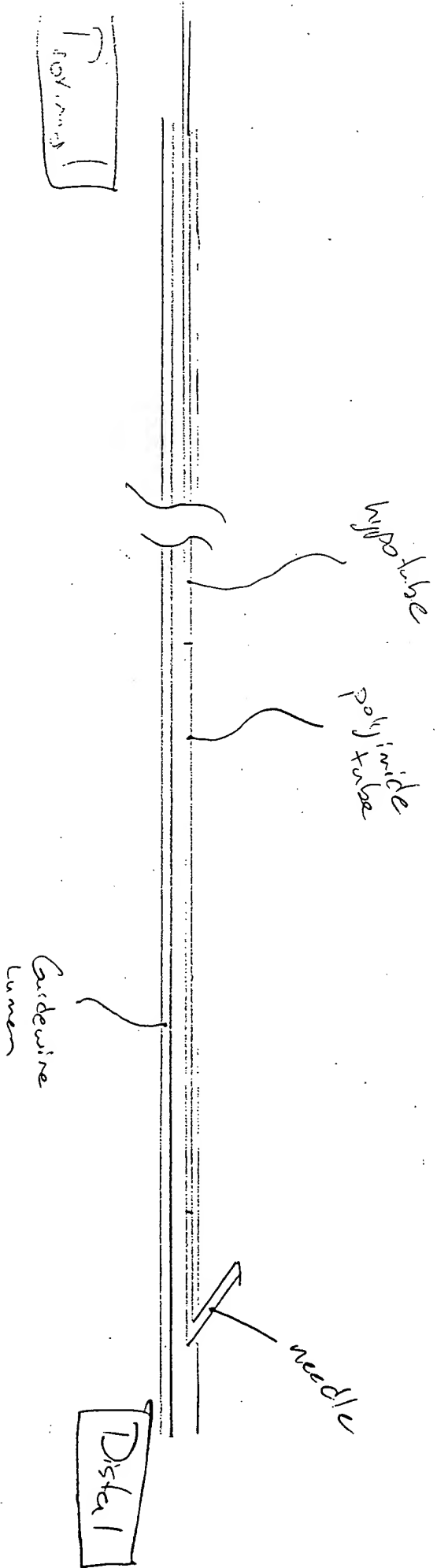
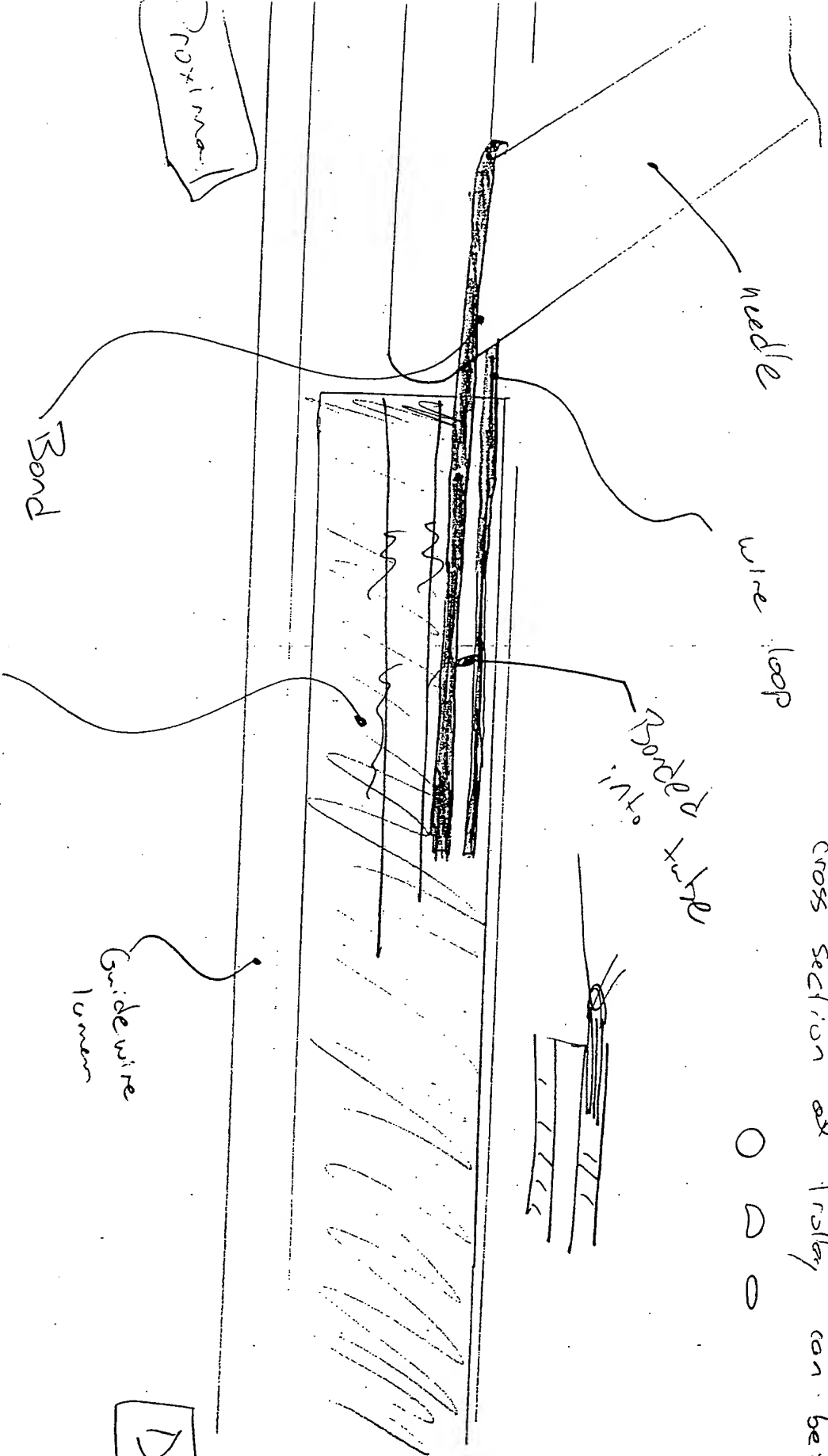


FIG 1

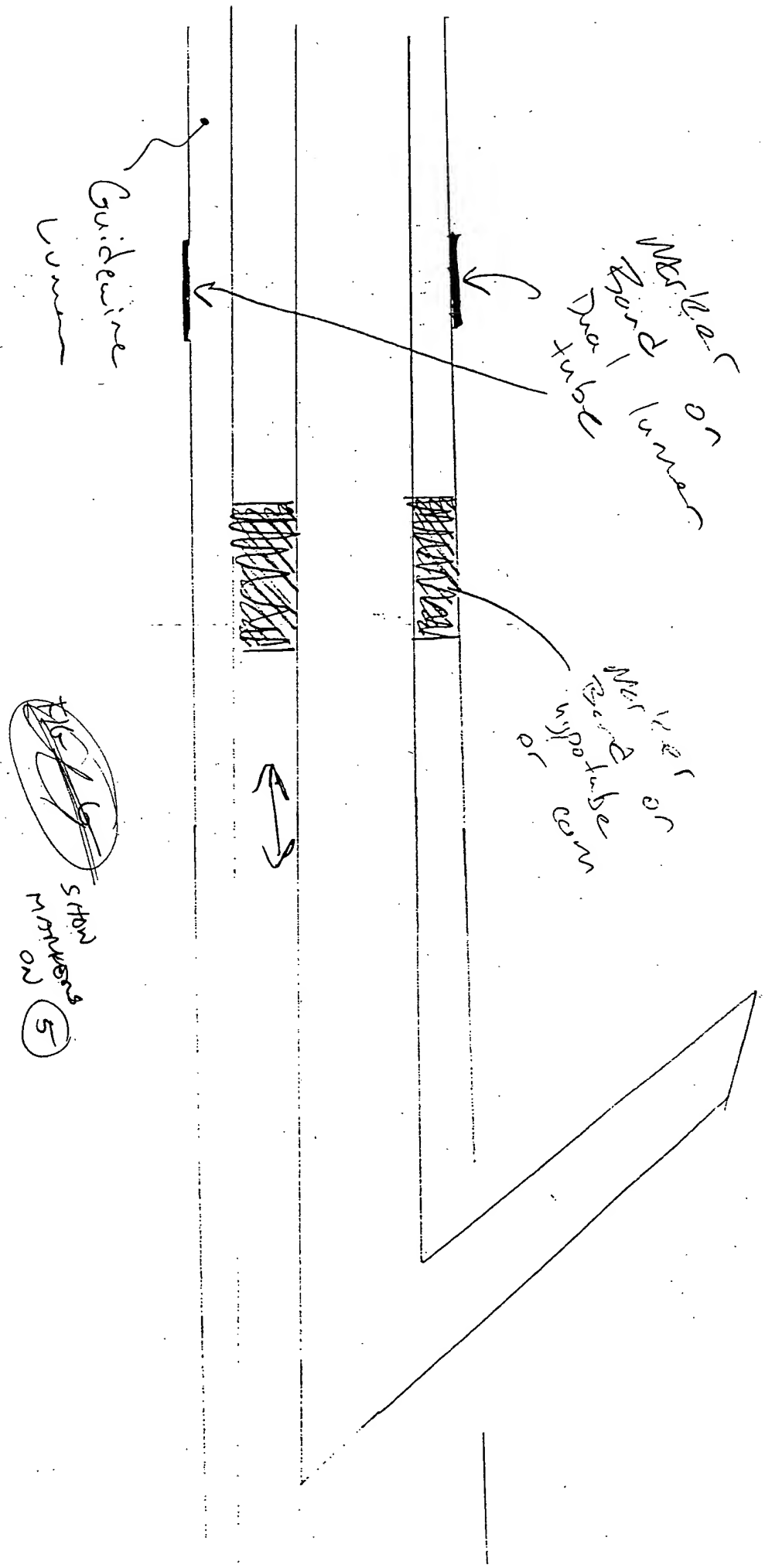
Tracking Trolley

cross section of trolley can be:



Purpose: Trolley guides the needle back into window when the hypotube is advanced.

opening stage



Purpose: indication of the degree to which the needle has opened a ϕ perforated

station numbers (5)

31. $\frac{DUE}{4/2/19}$

Distal tip

Polyimide tubing

5
10
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angle can be changed for different cutting effects

Beveled needle point
(angulation of needle point can be varied for different cutting effects)
 $L \approx \text{lumen}$

windows

large lumen
1/2 inch
1/4 inch
1/8 inch
1/16 inch

Proximal

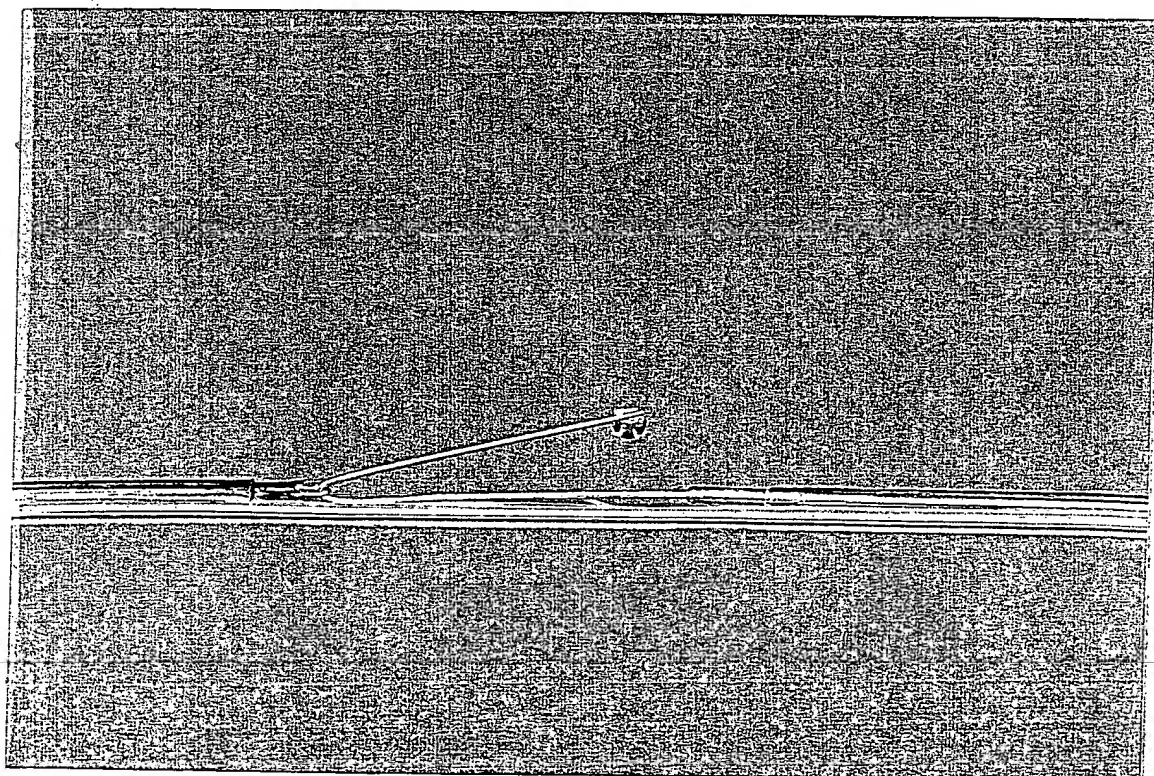
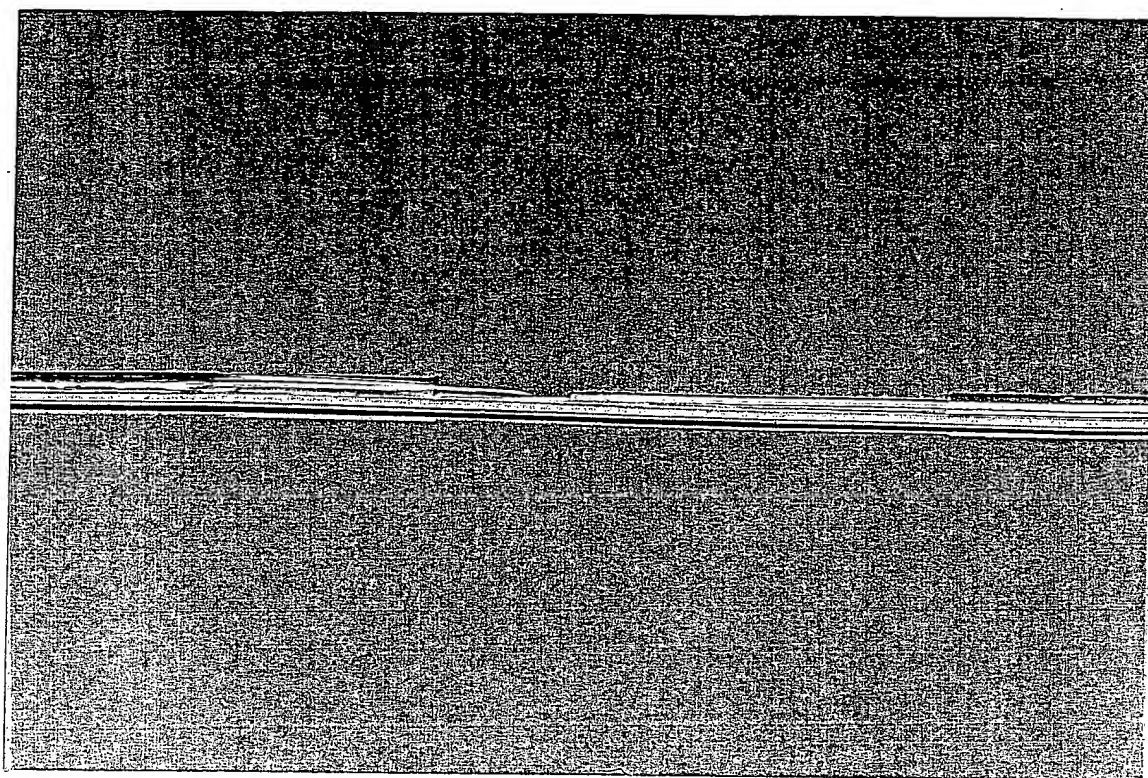
Stainless Steel
hypotube

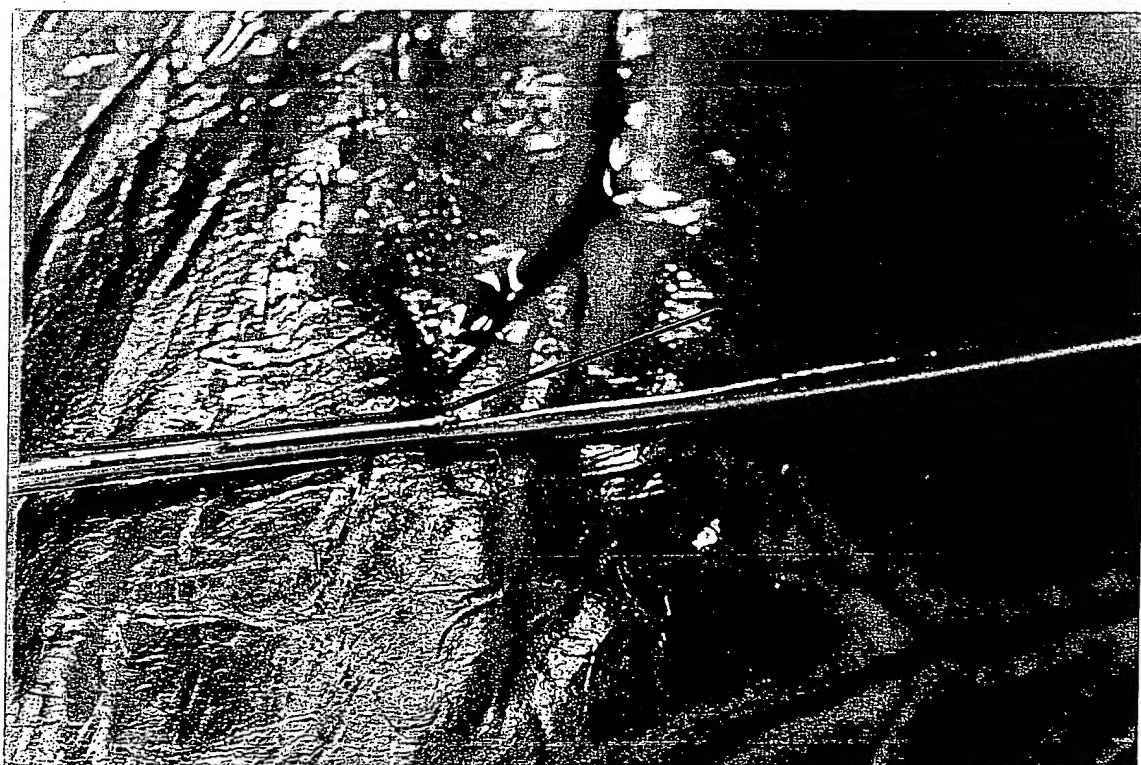
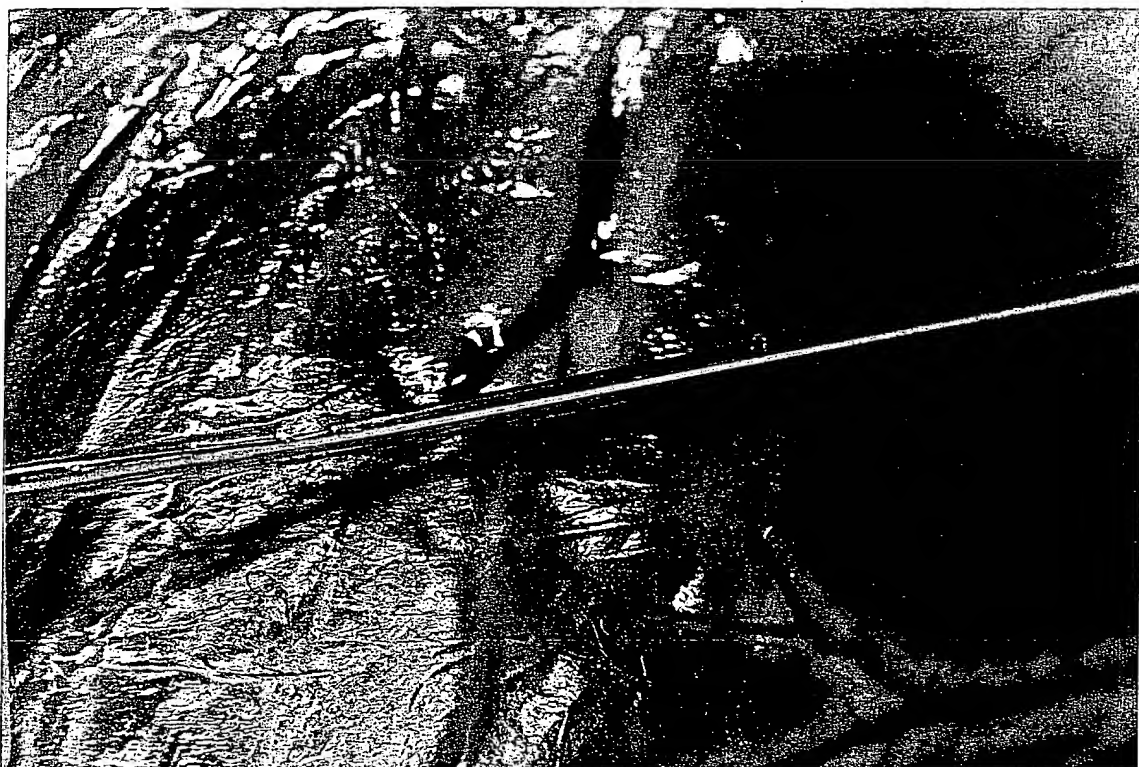


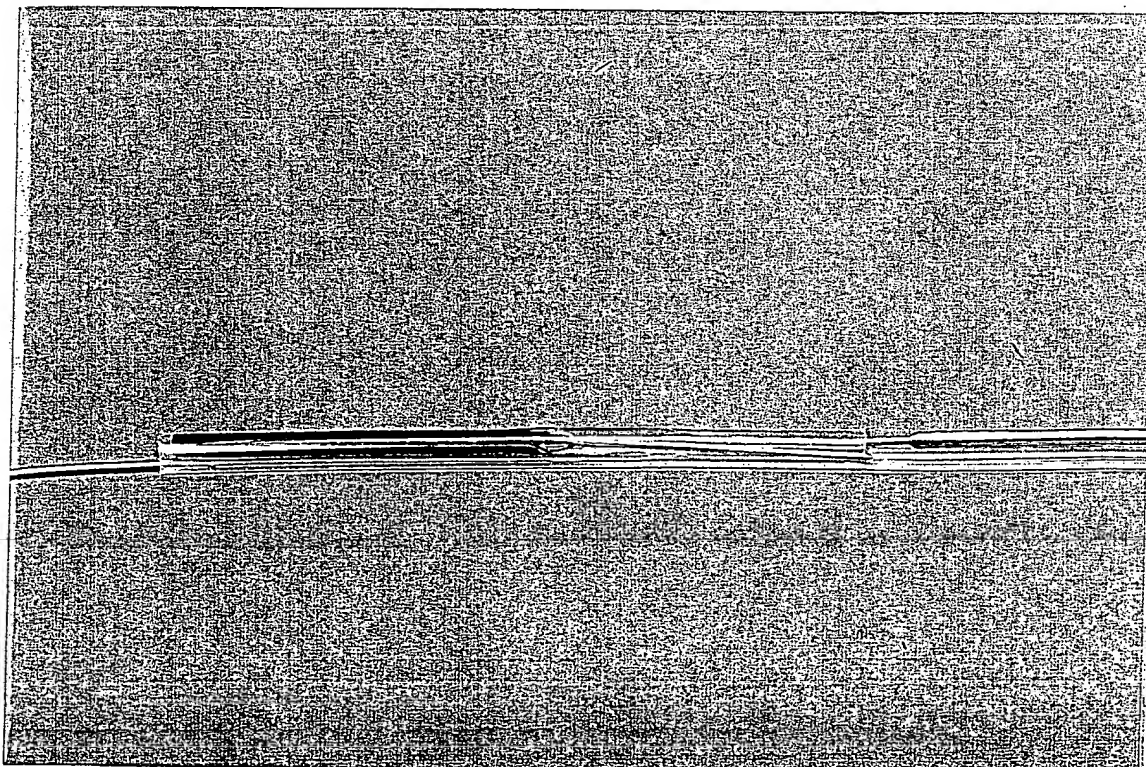
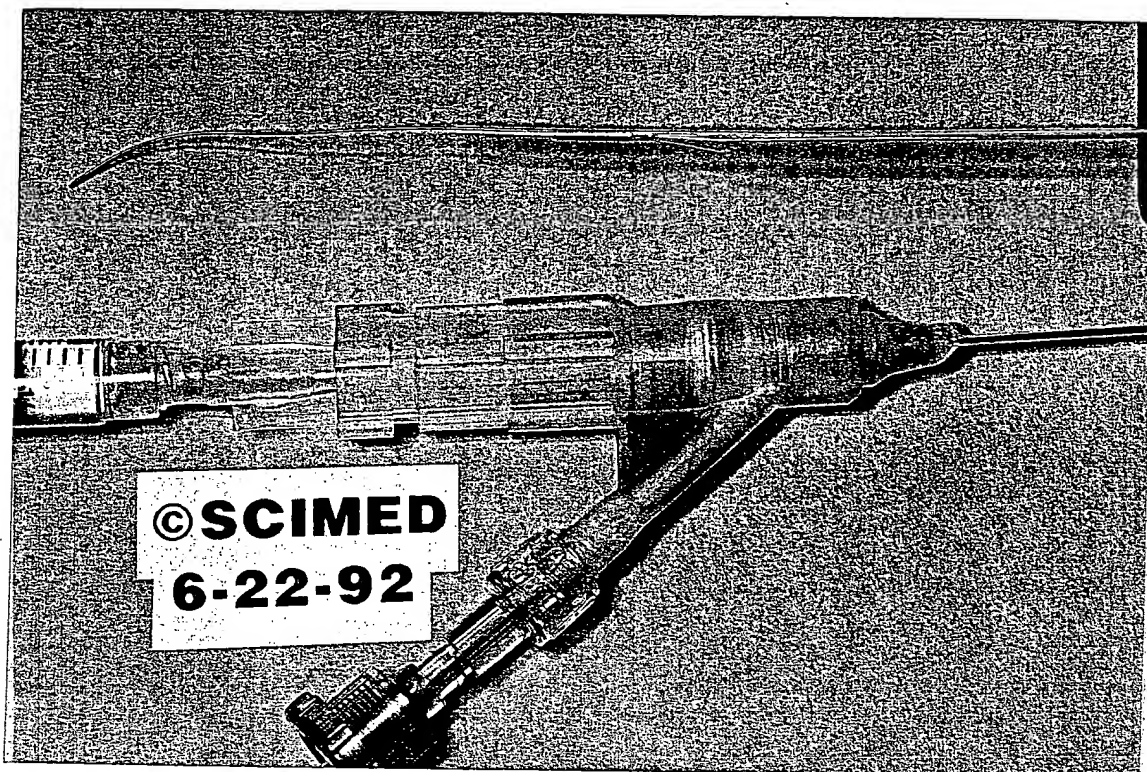
Dual Lumen
Cross-section

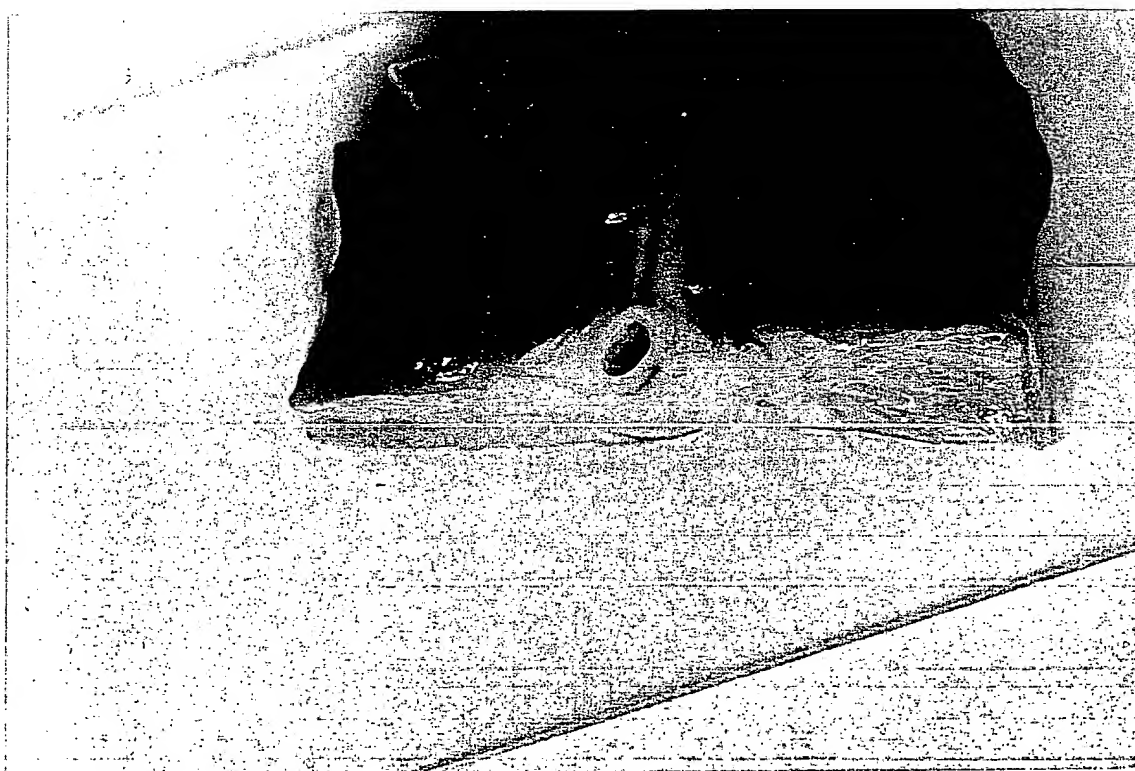
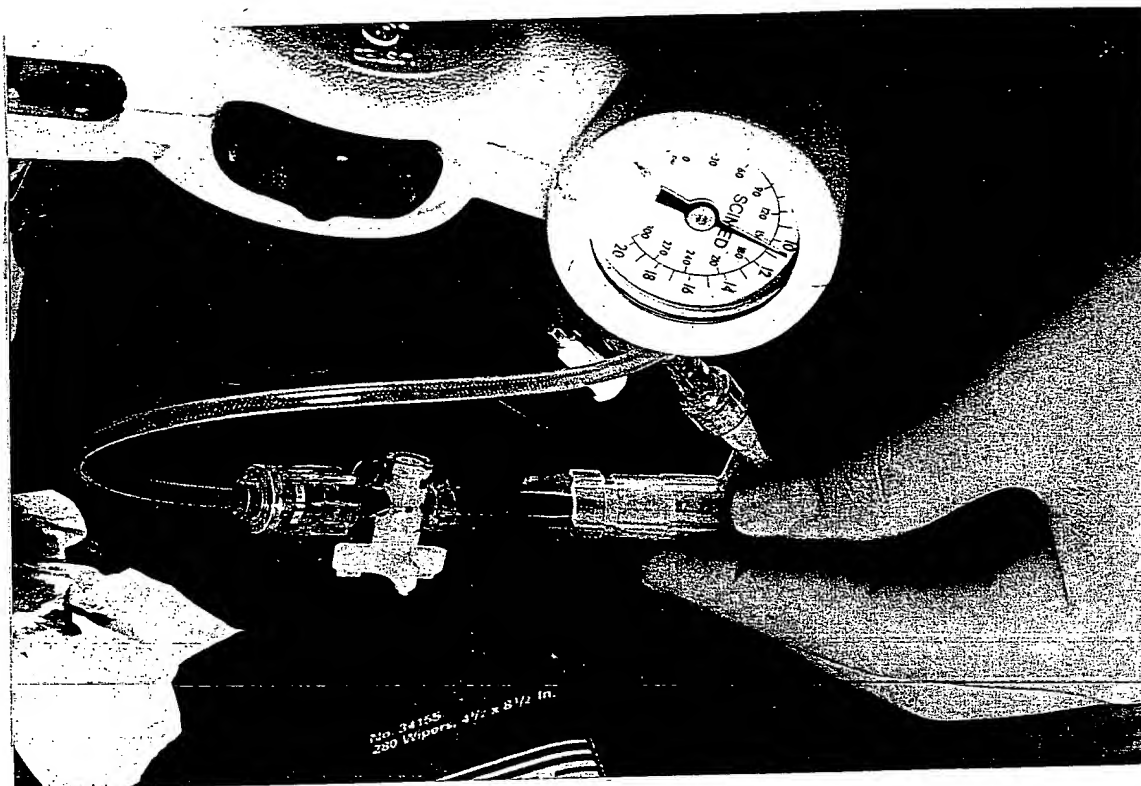
Guidewire lumen
currently accepts .014" wire

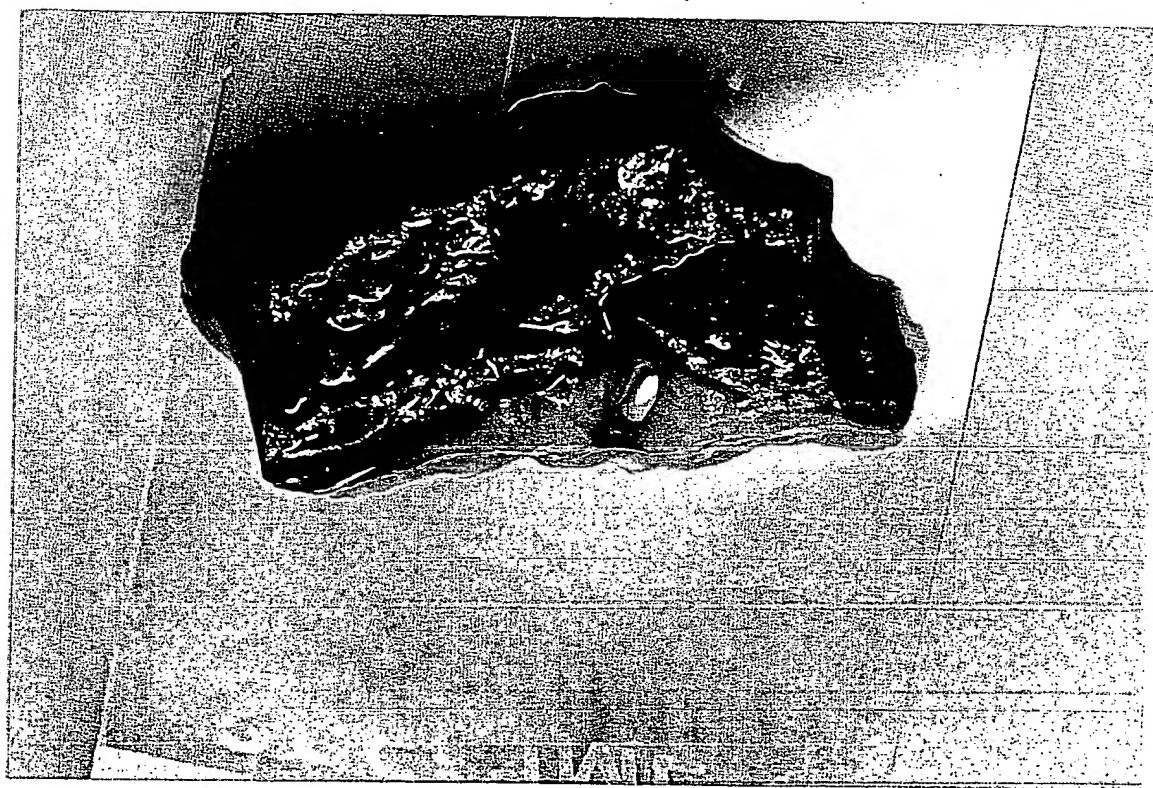
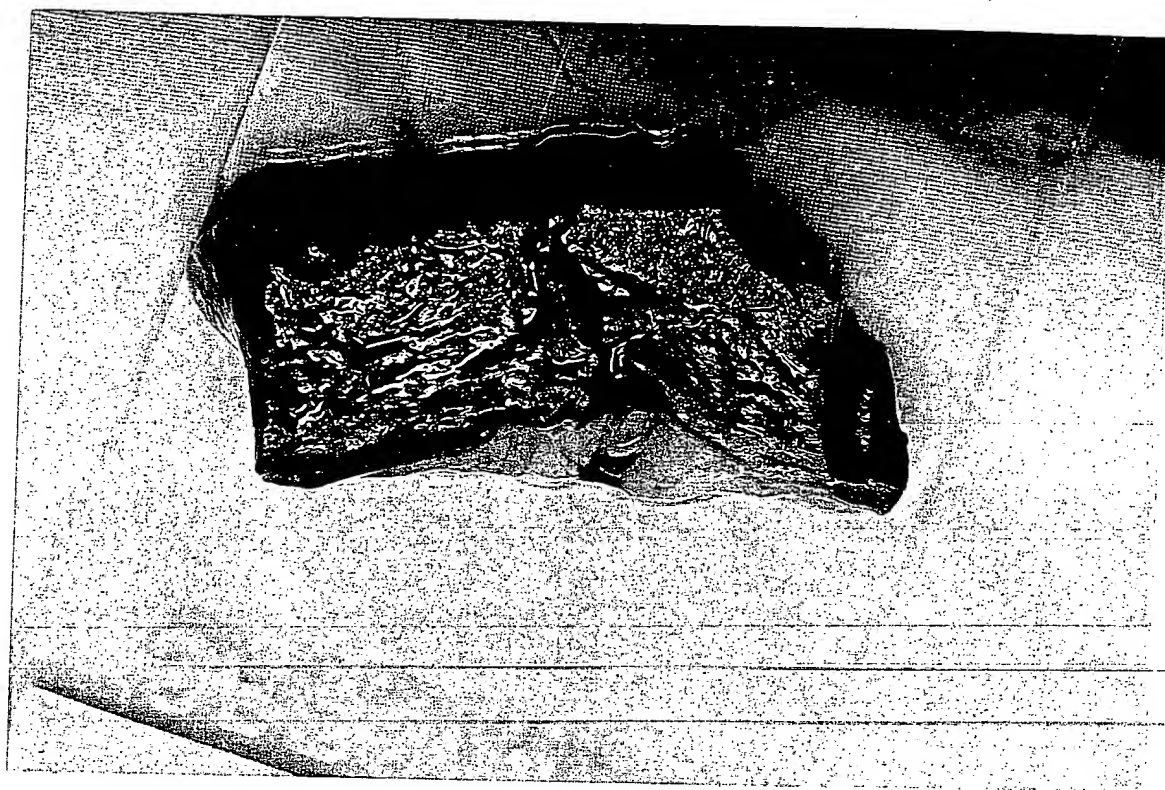
Distal











MEMORANDUM

TO: QS
FROM: U.S. Docket Department
RE: Client/Matter No. 3570/214
DATE: 10/28

APR 22 2002

An Information Disclosure Statement (IDS) is due in the above-identified case which was filed approximately three months ago.

Please indicate below whether or not an IDS will be prepared at this time.

 I will be preparing an IDS by the due date.

 I have reviewed the file and find that there is no relevant art which needs disclosure.

✓ An IDS was submitted on 11/2/92, and that information was, and still is, sufficient.

Karl Vach
(Attorney Signature)

11/12/92
(Date)

Note: Please return the attached file along with this completed form to the U.S. Docket Department.

WP/SMT4/MEMO.IDS/cw

Case No. 3530/216
Applicant Linden et al.

Hon. Commissioner of Patents & Trademarks
Washington, D.C. 20231

Please acknowledge receipt of the below-identified:

Assignment Transmittal Letter (in duplicate), together with Assignment Document, check in the amount of \$40.00, and postcard.

APR 22 2002

WILLIAM BRINKS OLDS HOFER GILSON & LIONE
A PROFESSIONAL CORPORATION

By *Gustavo Siller, Jr.*

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 2-28-94
Date of Deposit

Karl A. Vick
Name of applicant, assignee or
Registered Representative

Karl A. Vick
Signature

2-28-94
Date of Signature

APR 22 2002

Our Case No. 3570/216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Bradley C. Linden et al.

Serial No.: 07/913,227

Filed: July 14, 1992

For: Intra-Extravascular Drug Delivery
Catheter and Method

)
)
)
) Examiner C. Maglione
)
) Group Art Unit 3306
)
)

AMENDMENT

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In response to the office action dated October 26, 1993, please enter the following amendments and consider the accompanying remarks.

IN THE CLAIMS

Please amend Claims 1, 6, 8, 12, 13, 14, 21, and 23, as follows.

1.(twice amended) A method of treating a vessel having a vessel wall with an inner surface, the method comprising the steps of:

inserting a catheter having a vessel puncturing element disposed therein into [the] a substantially tubular vessel;

positioning the puncturing element at the site in the vessel to be treated;

[puncturing] moving said puncturing element in a direction substantially non-parallel with respect to a portion of said catheter that contains said puncturing element such that said puncturing element punctures the vessel wall at the site to be treated with the puncturing element; and

delivering via a delivery means a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall.

6.(twice amended) The method of claim 1 wherein the delivery means includes [a] said puncturing element having a drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

8.(twice amended) A drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising:

an elongated shaft adapted to be inserted into [a vessel having a] the vessel [wall];

said shaft comprising a puncturing element having a retracted position in which said puncturing element does not puncture said vessel wall, said puncturing element being housed in a portion of said shaft when said puncturing element is in said retracted position;

said puncturing element further having a puncturing position in which said puncturing element engages and punctures said vessel wall, said puncturing element being substantially non-parallel with respect to said portion of said shaft when said

puncturing element is in said puncturing position; and

delivery means coupled to said shaft for delivering a drug outside the inner surface of the vessel wall through a puncture in the vessel wall.

12.(one amended) The device defined in Claim 8 further comprising [means for moving] a coupling that moves said puncturing element from its retracted position to its puncturing position.

13.(once amended) The device defined in Claim 12 [further comprising means for moving] wherein said coupling also moves said puncturing element from its puncturing position to its retracted position.

14.(once amended) The device defined in Claim 13 further comprising [means for guiding] a guide that guides said puncturing element to its retracted position.

21.(once amended) The device defined in Claim [8] 20 wherein:

said needle is bent into a substantially U-shape when said puncturing element is in said retracted position; and

said needle is extended out to form a predetermined angle when said needle is in said puncturing position.

23.(once amended) The device defined in Claim 20 wherein said needle [comprises a tip pointed toward a distal end of said catheter] is substantially parallel with said portion of said shaft when said needle is in said retracted position, said needle also being substantially non-parallel with said portion of said shaft when said needle is in said puncturing position.

REMARKS

Claims 1-6 and 8-31 are pending in this application. In the office action mailed October 26, 1993, all of the pending claims were either rejected or objected to. In particular, Claims 5, 21, and 23-31 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Claims 5 and 24-31 were rejected as being drawn to an old combination of a drug delivery device and a particular drug to be delivered by the device. The drug delivery device is allegedly shown by U.S. patent no. 5,236,424 to Imran. Claims 1-4, 6, 8-10, 12-14, 20, and 23 were rejected under 35 U.S.C. § 102(e) as allegedly anticipated by Imran. Claims 5 and 24-31 were rejected under 35 U.S.C. § 103 as allegedly obvious in view of Imran. Claims 11, 15-19, and 22 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claim 21 would be allowable if rewritten to overcome the rejection under § 112 and to include all of the limitations of the base claim and any intervening claims.

Additionally, the Examiner has objected to previously requested amendments to the specification. The Examiner has found that the added material contains new matter.

Reconsideration of the current rejections and objections is respectfully requested. For the following reasons, Applicant respectfully submits that the cited Imran reference does not anticipate or render obvious the combination defined in the amended claims.

Regarding the previously requested amendments to the specification, Applicants respectfully submit that the originally filed dimensions of the D-shaped cams 38 (shown in Figures 7 and 8) were inadvertent typographical errors. That the incorrect dimensions were inadvertent typographical errors is shown by the fact that the incorrectly typed dimensions involved a misplaced decimal point and not a completely different number having all new

digits. Also, the D-shaped cam 38 fits inside the catheter shaft 21, and exemplary dimensions for the shaft 21 are stated in the specification (page 11, lines 23 and 24) as 4F (about 0.053") or 8F (about 0.080"). If the cams 38 were made with the incorrectly typed dimensions, they would be far too large to fit within the catheter shaft 21. Accordingly, Applicants respectfully submit that the specification as a whole supports a conclusion that the originally filed dimensions of the cams 38 were inadvertently typed with a misplaced decimal point, and the previously requested amendments to these dimensions simply correct typographical errors and do not introduce new matter.

With respect to the rejections under 35 U.S.C. § 112, second paragraph, Applicants have amended Claims 21 and 23 to provide proper antecedents and remove the reference to a "distal" end.

With respect to the rejections based on Imran, Applicants have amended the claims to more clearly set forth the distinctions between the Imran and the claimed subject matter. In particular, the claims more clearly define a drug delivery catheter capable of delivering a drug to the wall of a relatively small and delicate tubular body vessel surrounding the catheter. The claimed invention accomplishes this by, inter alia, moving its puncturing element at an angle away from its catheter shaft such that the puncturing element will contact the walls of the tubular body vessel surrounding the catheter. Additionally the claimed invention describes a novel puncturing element structure that allows it to move at an angle away from its catheter shaft when moving to its puncturing position. In contrast, the Imran device's puncturing element is relatively straight, large and bulky and moves parallel with respect to its catheter to make a direct puncture through the relatively thick and tough myocardium layers of the heart.

In conclusion, Applicants respectfully submit that every ground for rejection has been overcome by the amendments and remarks herein. Accordingly, the application is in condition for

allowance, and early notice to this effect would be greatly appreciated.

If, for any reason, the Examiner is unable allow the application on the next office action and feels that a telephone conference would help clear up any unresolved matters, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number listed below.

Respectfully submitted,



Karl A. Vick
Registration No. 33,288
Attorney for Applicant

WILLIAM BRINKS HOFER
GILSON & LIONE
P.O. BOX 10395
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(312) 321-4247

WILLIAM BRINKS OLDS HOFER GILSON & LIONE

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CABLE JUDICATURE CHICAGO

TELEX 254300

FACSIMILE 312 321-4299

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TELEPHONE 202 429-0625
TELEX 650 383-5605
FACSIMILE 202 293-1850

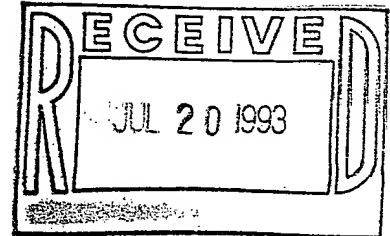
ARLINGTON, VA. OFFICE
CRYSTAL PLAZA ONE
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2001 JEFFERSON DAVIS HWY.
ARLINGTON, VIRGINIA 22202-3603
TELEPHONE 703 521-1177
TELEX 140994
FACSIMILE 703 486-0187

INDIANAPOLIS OFFICE
ONE INDIANA SQUARE
SUITE 3160
INDIANAPOLIS, INDIANA 46204-2001
TELEPHONE 317 636-0886
TELEX 469632
FACSIMILE 317 634-6701

TOLEDO OFFICE
1130 EDISON PLAZA
TOLEDO, OHIO 43604-1537
TELEPHONE 419 244-6578
TELEX 140342
FACSIMILE 419 244-8862

KARL A. VICK
(312) 321-4247

July 16, 1993



Mr. Donald F. Palme II
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, Minnesota 55311-3648

APR 22 2002

Re: U.S. Application Serial No. 913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our File No. 3570/216

Dear Don:

The enclosed amendment was filed with the U.S. Patent and Trademark Office on Monday, July 12, 1993.

Your comments about the Office Action and the cited references were received in our offices on April 20, 1993. Therefore, SciMed will not be billed for the last two months of the three-month extension fee.

I will write to you again as soon as the Patent and Trademark Office acts further on the application.

Sincerely,

Karl
Karl A. Vick

KAV/law
Enclosure

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 7-12-93
Date of Deposit

Karl A. Vick
Name of applicant, assignee or
Registered Representative
Karl A. Vick
Signature
7-12-93
Date of Signature

Our Case No. 3570/216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
Bradley C. Linden et al.)
Serial No. 07/913,227)
Filed: July 14, 1992) Group Art Unit 3306
For: Intra-Extravascular Drug)
Delivery Catheter and)
Method)

AMENDMENT

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In response to the supplemental first office action mailed January 11, 1993, please enter the following amendments and consider the accompanying remarks.

IN THE SPECIFICATION

Page 1, line 24, change "can be" to -- is --;

Page 15, line 11, change '0.418"' to --0.0418"--; line 12, change '0.223"' to --0.0223"--; line 12, change '0.844"' to --0.0844"--.

IN THE CLAIMS

Please amend Claims 1, 6, 8, 9, 15, 18 and 20, and add new Claims 22 to 31 as follows.

In Claim 1, line 10, after "delivering", insert "-- via a deliver means --";

6. (once amended) The method of claim 1 wherein the delivery means includes a puncturing element having a [includes an] drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

8. (once amended) A drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising:

an elongated shaft adapted to be inserted into the vessel;

said shaft comprising a puncturing element [coupled to said shaft;

said puncturing element] having a retracted position in which said puncturing element does not puncture [engage] said vessel wall; [and]

said puncturing element further having a puncturing position in which said puncturing element [extends outwardly from said shaft engage and puncture] engages and punctures said vessel wall; and

delivery means coupled to said shaft for delivering a drug outside the inner surface of the vessel wall through a puncture in the vessel wall.

9. (once amended) The device defined in Claim 8 wherein said shaft [puncturing element] is housed inside an elongated catheter also adapted to be inserted into said vessel.

15. (once amended) The device defined in Claim 8 wherein:

said shaft further comprises an inner shaft lumen;

said puncturing element further comprises a needle having an inner lumen in fluid communication with said inner shaft lumen;
and

said delivery means comprises said inner shaft lumen and said inner needle lumen [said inner shaft lumen is in fluid communication with said inner needle lumen so that fluid can flow from said inner shaft lumen to said inner needle lumen].

18. (once amended) The invention defined in Claim 17 wherein said delivery means further comprises [comprising] an injection device coupled to said inner shaft lumen for injecting fluid through said inner shaft lumen.

Claim 20, line 1, change dependency from "Claim 8" to -- Claim 20 --.

--22. (new) The device defined in Claim 20 wherein: said needle is bent to a first predetermined angle when said puncturing element is in said retracted position; and said needle is extended out to form a second predetermined angle when said needle is in said puncturing position.

--23. (new) The device defined in Claim 20 wherein said needle comprises a tip pointed toward a distal end of said catheter when said needle is in said retracted position.--

--24. (new) The method of Claim 1 wherein said drug comprises an antiproliferative drug for the treatment of restenosis.--

--25. (new) The method of Claim 1 wherein said drug comprises an antiproliferative drug for the treatment of vascular disease.--

--26. (new) The method of Claim 1 wherein said drug comprises a specific inhibitor of cellular proliferation.--

--27. (new) The method of Claim 1 wherein said drug comprises a specific inhibitor of thrombin.--

--28. (new) The method of Claim 1 wherein said drug comprises a specific inhibitor of platelets.--

--29. (new) The method of claim 1 wherein said drug comprises a genetic material. --

--30. (new) The method of claim 1 wherein said drug comprises a genetic material that when incorporated into cells results in the expression of therapeutic materials.--

--31. (new) The method of claim 1 wherein said drug is incorporated into a time released matrix.--

Remarks

Claims 1-6 and 8-21 are pending in this application. In the supplemental first office action mailed January 11, 1993, all of the pending claims were rejected. In particular, Claims 1-6 and 8-21 have been rejected under 35 USC §112 as allegedly indefinite. Claims 8-20 and 12-14 have been rejected under 35 USC §102 as allegedly anticipated by Hawkins. Claims 8-14 have been rejected under 35 USC §102 as allegedly anticipated by Sewell. Claims 8-9, 12-17 and 19-20 have been rejected under 35 USC §102 as allegedly anticipated by Bogue. Reconsideration of the outstanding rejections is respectfully requested.

The Examiner has indicated that Claims 1-6, 18, and 21 would be allowable if rewritten to eliminate their dependency on currently rejected claims. Applicants acknowledge this statement regarding potential allowability of these claims, and aside from a few amendments of form, applicants make no further statement about these claims.

Some of the claims have been amended to clarify the distinctions between the claimed invention and the cited art. In particular, claim 8 has been amended to recite a structure that is not shown or suggested by the cited art, whether taken alone or in combination.

In particular, Claim 8 as amended calls for a drug delivery device for treating a vessel having a vessel wall with an inner surface, the device comprising: an elongated shaft adapted to be inserted into the vessel; the shaft comprising a puncturing element having a retracted position in which the puncturing element does not puncture the vessel wall; the puncturing element further having a puncturing position in which the puncturing element

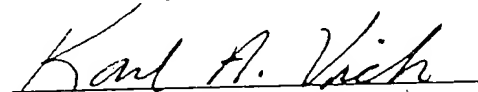
engages and punctures the vessel wall; and delivery means coupled to the shaft for delivering a drug outside the inner surface of the vessel wall through a puncture in the vessel wall.

The amended claims, and particularly amended Claim 8, clarify that the devices disclosed in the cited art are completely different from the claimed invention in numerous respects. The most important and fundamental of these differences is the fact that the cited art devices do not and cannot deliver drugs to a vessel wall as recited in the claims.

Accordingly, Applicants submit that the pending claims as amended are in condition for allowance, and early notice to this effect is respectfully requested.

If, for any reason, the Examiner is unable to allow the application on the next office action and feels that a direct communication would be beneficial, the Examiner is respectfully urged to contact the undersigned attorney directly at (312) 321-4247.

Respectfully submitted,



Karl A. Vick
Registration No. 33,288
Attorney for Applicant

WILLIAM BRINKS OLDS HOFER
GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4247

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 7-12-93
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Karl A. Vick
Name of applicant, assignee or
Registered Representative
Karl A. Vick
Signature
7-12-93
Date of Signature

Our Case No. 3570/216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
Bradley C. Linden et al.)
Serial No. 07/913,227)
Filed: July 14, 1992) Group Art Unit 3306
For: Intra-Extravascular Drug)
Delivery Catheter and)
Method)

PETITION AND FEE FOR EXTENSION OF TIME (37 CFR § 1.136(a))

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

This is a petition for an extension of the time to respond to the Office Action of January 11, 1993 for a period of three months.



Applicant is:

☐

a small entity, verified statement is:

☐

attached

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already filed

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other than small entity

	<u>Extension Months</u>	<u>Other Than Small Entity</u>	<u>Small Entity</u>
<input type="checkbox"/>	One Month	\$110	\$55
<input type="checkbox"/>	Two Months	\$360	\$180
<input checked="" type="checkbox"/>	Three Months	\$840	\$420
<input type="checkbox"/>	Four Months	\$1,320	\$660

Fee Payment

- ☐ Attached is a check for \$840 for the Petition fee.
- ☐ Charge Petition fee to Deposit Account No. 23-1925. A duplicate copy of this Petition is attached.
- ☒ Charge any additional fee required or credit for any excess fee paid to Deposit Account No. 23-1925. A duplicate copy of this Petition is attached.

Respectfully submitted,

Karl A. Vick

Karl A. Vick
Registration No. 33,288
Attorney for Applicant

WILLIAM BRINKS OLDS HOFER
GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

FORM PTO-1449 LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT (use several sheets if necessary)	SERIAL NO. 07/913,227	ATTORNEY DOCKET NO. 3570/216
	FILING DATE July 14, 1992	GROUP ART UNIT 3306
	APPLICANT(S): Bradley G. Linden et al.	

REFERENCE DESIGNATION		U.S. PATENT DOCUMENTS				
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS/ SUBCLASS	FILING DATE
	A1	4,636,195	01/1987	Wolinsky		
	A2	4,824,436	04/1989	Wolinsky		

FOREIGN PATENT DOCUMENTS						
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS/ SUBCLASS	TRANSLATION YES NO

OTHER ART (Including Author, Title, Date, Pertinent Pages, etc.)		
A3	Article "Use of a Perforated Balloon Catheter to Deliver Concentrated Heparin Into the Wall of the Normal Canine Artery", by Harvey Wolinsky, MD, PhD, FACC. SWAN N. Thung, MD, New York, American College of Cardiology-0735-1097/90, JACC Vol. 15, No. 2, February 1990:4/5-81, pp. 475-481.	
A4	Article "Phosphate Compounds of the Rabbit Red Blood Cell During Storage in Acid Citrate Dextrose (ACD) and ACD-Inosine", by Grant R. Bartlett and A. William Shafer (From the Scripps Clinic and Research Foundation, LaJolla, Calif.) (Submitted for publication June 8, 1959; accepted September 10, 1959), pp. 62-68	
A5	Article "Effect of Controlled Adventitial Heparin Delivery On Smooth Muscle Cell Proliferation Following Endothelial Injury" by Elazer R. Edelman, David H. Adams and Morris J. Karnovsky, Proc. Natl. Acad. Sci. USA, Vol. 37, pp. 3773-3777, May 1990, Medical Sciences	
A6		
A7		
A8		

APR 27 2002

EXAMINER	DATE CONSIDERED
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EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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NOTICE OF MAILING TO PATENT OFFICE

APPLICANT: Craden et al.
CLIENT/MATTER NO. 35701216
(CASE NO.)

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SEC. Y
INTERNAL

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ATTORNEY/SECRETARY

APR 22 1992

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CLIENT/MATTER NO.:

(CASE NO.):

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ATTORNEY/SECRETARY

Case No. 3570/216
Applicant Linden et al.

Hon. Commissioner of Patents & Trademarks
Washington, D.C. 20231

Please acknowledge receipt of the below-identified:

Response to Notice to File Missing Parts (in duplicate), Form 1533 (PTO copy), Power of Attorney,
Declaration, Surcharge in the amount of \$130.00, and postcard.

WILLIAN BRINKS OLDS HOFER GILSON & LIONE
A PROFESSIONAL CORPORATION

By Gustavo Siller, Jr.

APR 22 2002

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APPLICANT:

CLIENT/MATTER NO:

(CASE NO.):

Linden et al.

3570/216

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9/4/92

DATE OF MAILING:

8/21/92

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W.S. Jr./ps
ATTORNEY/SECRETARY

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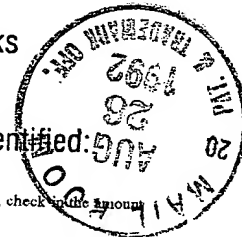
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Case No. 3570/216
Applicant Linden et al.

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Washington, D.C. 20231

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WILLIAM BRINKS OLDS HOFER GILSON & LIONE
A PROFESSIONAL CORPORATION

By Gustavo Siller, Jr.

APR 22 2002

Case No. 3570/216
Applicant Linden et al.

APR 22 2002

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

For: INTRA-EXTRAVASCULAR DRUG
DELIVERY CATHETER AND METHOD

Attention: Manager,
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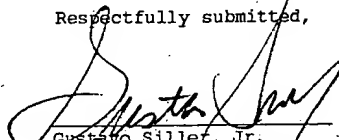
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Respectfully submitted,


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Attorney for Applicant

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Honorable Commissioner of
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APR 22 2002

Re: Applicants: Linden et al.
Title: INTRA-EXTRAVASCULAR DRUG
DELIVERY CATHETER AND METHOD
Serial No.: 07/913,227
Filed: July 14, 1992
Our File No. 3570/216

Dear Sir:

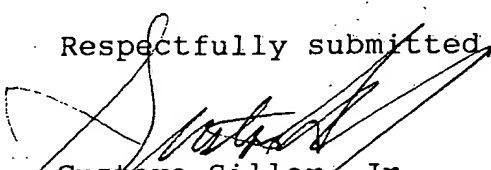
Enclosed herewith, for recording in the United States Patent and Trademark Office, is an Assignment in the above-identified case to SciMed Life Systems, Inc.

Enclosed is a check for \$40.00 to cover the recording fee. The Commissioner is hereby authorized to charge any deficiencies in fees or charge any overpayment to Deposit Account No. 23-1925. A duplicate copy of this correspondence is attached.

Please return the recorded assignment to:

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Respectfully submitted,


Gustavo Siller, Jr.
Registration No. 32,305

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Enclosures

Inventor(s): Bradley C. Linden and Do 1 F. Palme II

Title: INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD

POWER OF ATTORNEY

The specification of the above-identified patent application:

☐ is attached hereto☒ was filed on July 14, 1992 as application Serial No. 07/913,227

I hereby appoint the following attorneys to prosecute the patent application identified above and to transact all business in the Patent and Trademark Office connected therewith:

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The undersigned hereby authorizes the U.S. attorneys named herein to accept and follow instructions from William Brinks Olds Hofer Gilson & Lione as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by the undersigned.

(check one)

☐ Inventor(s)☒ Owner by Assignment

Date: SCIMED LIFE SYSTEMS, INC.

Assignee

Date:

W. Brinks
Signature

Date:

8/6/92

Date:

Sr. Vice President, Technology & R&D
Name, Title

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD, the specification of which:

 is attached hereto.

 X was filed on July 14, 1992 as Application Serial No. 07/913,227

 and was amended on (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

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<u>(Number)</u>	<u>(Country)</u>	<u>(Day/Month/Year Filed)</u>	<u>Yes</u>	<u>No</u>
<p>I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:</p>				

<u>(Application Serial No.)</u>	<u>(Filing Date)</u>	<u>(Status-patented, pending, abandoned)</u>
<p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		

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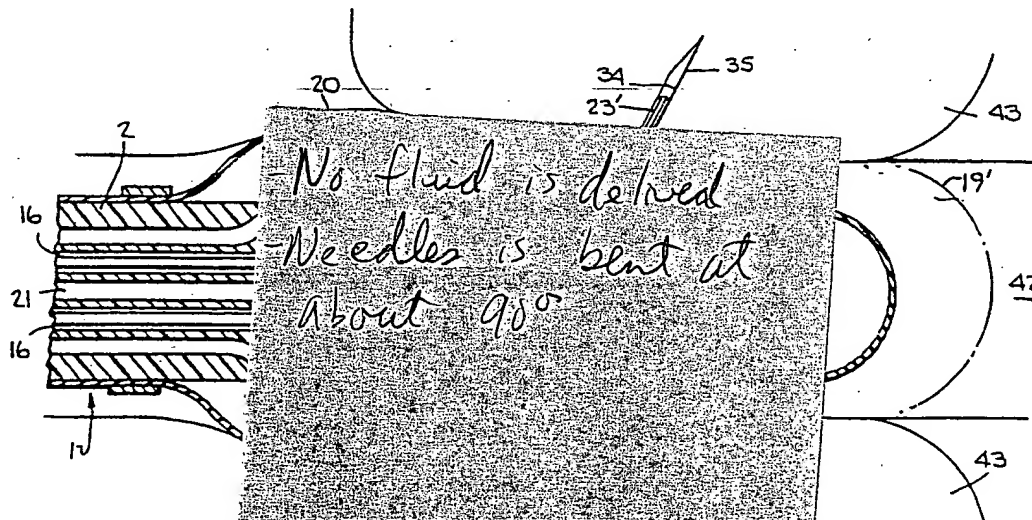
10 December 1990 (10.12.90) US

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amendments.*

(54) Title: A DEVICE AND METHOD FOR INTERSTITIAL LASER ENERGY DELIVERY



(57) Abstract

Disclosed is a catheter and movable fiber optic elements (23', 23'') and thermo-measuring devices (24) through which the catheter is positioned adjacent to the organ and the needles are extended to mechanically puncture and move into the organ with the fiber optic elements. The needle may be withdrawn into the catheter before delivery of laser energy or remain in the organ to serve as an aspiration-irrigation vehicle. Lumens (16) provided in the catheter for carrying the hollow needles may likewise be used for aspiration or irrigation of the passageway. A dilation balloon (19, 20) may be provided in order to temporarily fix and support the catheter while the needle is inserted into the organ. The temperature of the area being treated is monitored by thermomeasuring devices provided on the fiber optic elements. Small puncture holes created by the hollow needles heal quickly and minimize risk of infection.

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-1-

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A DEVICE AND METHOD FOR INTERSTITIALLASER ENERGY DELIVERYField of the Invention

This invention relates to an apparatus and method for laser energy delivery to internal organs for treatment thereof and in particular, treatment of diseases of the prostate, including benign prostatic hypertrophy (BPH) and prostatic cancer. More particularly, the invention relates to a catheter including a needle means for delivering a laser guiding optical fiber directly to the area to be treated by energy delivery.

Background of the Invention

Prostatic disease is one of the most common diseases in men in the United States. Prostatic disease, as referred to here, includes benign prostatic hypertrophy (BPH) and prostatic cancer. These two etiologies affect a majority of men over the age of 60.

The clinical symptoms of BPH include urinary tract outlet obstruction due to an enlarged prostate. The etiology of BPH, while not fully understood, has focused on two hypotheses. The first hypothesis has identified the hyperplastic cell morphology as a stromal cell disease. The second hypothesis has investigated the effects of prohormone dihydrotestosterone (DHT), which is the primary mediator of androgen action in the prostatic cells.

The currently accepted treatment for BPH is transurethral resection of the prostate (TURP). Approximately 300,000 TURPs per year are performed to treat this disorder in the United States. Morbidity and mortality for TURP are 17 and 1 percent, respectively, for all age groups combined. Higher complication rates occurs in older populations with an annual surgical and hospitalization cost in excess of \$1 billion per year.

Among other treatment available for the condition of BPH are pharmacological means such as vasoactive and antiandrogen agents. The vasoactive drugs primarily used are alpha₁ receptors, without effecting the alpha₂ receptors. These drugs reduce smooth muscle tone within the prostate, which is in part responsible for the mechanical obstruction of urine through the prostatic urethra. Data on this treatment suggest good efficacy in relieving symptoms, but it should be noted that mechanical obstruction may still exist and may promote the development of urinary tract infection bladder stones and possible upper urinary tract obstruction.

-2-

Antiandrogen agents have also been used to reduce the symptoms associated with BPH. The primary function of these antiandrogen blockers is to reduce the effects of DHT activity in the prostate by competing for the androgen receptors. While there has been evidence of the clinical efficacy of these agents in reducing the size of the prostate and relieving the symptoms associated, the problem with this pharmacological intervention has been the slow onset of therapeutic action.

With regard to prostatic cancer, both the incidence and mortality are on the rise. It is expected that over 100,000 new cases will be diagnosed this year alone, with some 30,000 cases proving fatal.

While the etiology of prostatic cancer is also not well known, it has been suggested that this disease is either biochemically or genetically induced. The symptoms of prostatic cancer are insidious and are usually not clinically manifest until the course of the disease is far advanced. The current treatment of choice for prostatic cancer is to perform a radical prostatectomy which involves surgical excision of the prostate gland.

In both cancerous and benign conditions, the cause of the reduction of the available flow channel in the lumen of the vessel i.e., the prostatic urethra, is an externally induced compression of the vessel wall due to the proliferation of epithelial, prostatic cell tissue. In order to be effective, treatment of diseases of the prostate must cause a reduction in the mass of the prostatic tissue responsible for creating the compressive forces on the urethra which results in the obstruction of flow through the lumen of the urethra. This is accomplished either by surgical excision of the tissue or by other means which will cause necrosis of the cells and shrinkage of the tissue mass.

Laser energy may be applied at at least four different levels in order to affect the tissue being treated. The first and lowest level of laser energy delivery is induced fluorescence. At this level, laser light energy is directed into the cells to reversibly energize the cells. The fluorescence effect occurs as energy is given off in returning to the lower energy state. The next level results in cellular change due to photo-effect. Laser light energy is directed into the cells at an irreversible level, but below that required to produce hyperthermia. At this level of energy delivery, cellular change (including necrosis if desired) occurs at the molecular level due to the photo effects of laser light. The third level of energy delivery results in hyperthermia by raising cells to a temperature level (42-44°C) where necrosis occurs. The fourth level of energy

-3-

delivery is vaporization. This requires delivery of laser energy sufficient to produce temperatures of about 100°C in the tissue being treated.

Laser hyperthermia has been suggested as a possible means for necrosis of diseased prostatic cells. But, to date, practical means for applying laser hyperthermia
5 have not been developed.

U.S. patent No. 4,672,963 to Barken discloses an apparatus and method for laser surgery which uses a computer controlled, ultrasonic imaging system to position a laser light guide within a patient. This patent discusses prostatic disease and purports to provide suitable apparatus for treatment; however, no specific means for
10 directing the laser energy to the area in need of treatment is disclosed. Barken states only that an optical light guide can be inserted into the body through a relatively small surgical opening.

U.S. Patent No. 4,950,267 to Ishihara et al. discloses a laser beam treatment device for an endoscope. The endoscope delivers a laser probe to a position in a
15 body, from which the laser probe is thrust into the part of the organ to be treated. The disclosure is not specific as to how the laser probe is inserted into the organ. Known fiber optic elements generally do not possess sufficient rigidity to mechanically puncture a body structure such as the urethral wall. Furthermore, Ishihara discloses a number of alternative laser probes having blunt or rounded distal ends. It is unlikely that these
20 probes could be mechanically forced into an organ even if they possessed substantial structural rigidity. Thus, it appears that insertion of at least some of the Ishihara laser probes requires coincidental application of laser energy to burn a hole into the organ. This method of insertion is undesirable because, upon withdrawal of the instrument, a small hole will remain with the possibility of abscess and infection.

25 The above-mentioned patents discuss only laser hyperthermia. They do not address possible treatments using the other three energy levels previously discussed. Thus, there is a need in the field of medical laser energy delivery, including treatment of prostatic disease, for an effective means for delivering various laser energy levels to the areas to be treated. In the treatment of prostatic disease, alternatives are needed
30 to the more radical and consequently complicated and more dangerous surgical procedures which currently are the treatments of choice, namely, TURP for BPH and radical prostatectomy for prostatic cancer.

Summary of the Invention

It is therefore an object of the present invention to provide a practical means for laser energy delivery to the prostate or other organs adjacent to a body passageway.

It is also an object of the present invention to provide a procedure for treatment
5 of the prostate or other organs which is potentially bloodless compared to known procedures and is a less invasive single procedure that can be performed on an outpatient basis. According to the present invention, these and other objects are achieved by providing a catheter with at least one moveable hollow needle that carries a fiber optic element. In this manner, the catheter may be inserted into a body
10 passageway adjacent to the organ to be treated. The moveable needles are extendable to mechanically puncture the passageway wall and carry the fiber optic elements into the organ to the area to be treated. After the desired level of laser energy has been applied to the area being treated, the fiber optic elements and hollow needles are withdrawn into the catheter. The catheter is then removed from the passageway.
15 Thus, laser energy delivery with the present invention leaves behind only small puncture wounds in the passageway wall. Due to the nature of the mechanical puncture wounds they are capable of healing quickly with a minimum risk of infection.

The present invention generally includes the following components: At least one fiber optic element for delivering laser light from a laser energy source to the area of
20 the prostate to be treated. The fiber optic element is slidably received in and carried by a hollow needle. The hollow needle has a sharpened distal end in order to easily mechanically puncture the passageway wall and enter the organ to carry the fiber optic element to the area to be treated. The fiber optic element is slidably disposed within the needle to allow relative axial movement between the element and the needle. Thus,
25 the needle is retractable separately from the fiber optic element.

The needle is received in a flexible catheter shaft which is inserted into the passageway. Any number of needles may be carried in the catheter shaft. The number of needles is limited only by the diameter of the catheter shaft. Generally, one fiber optic element is carried by each needle. The needles are slidably received in needle
30 lumens within the catheter shaft. At the distal end of the catheter shaft a distal tip is provided to guide the needles outward and into the prostate. The means for directing the needles may be simply a number of curved channels communicating with the

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needle lumens to guide the needles in the desired direction, or may comprise a bearing and track system for guiding each needle.

The present invention also include a means for actuating and controlling the needles in order to move each needle between a first position, sheathed within the catheter shaft and distal tip, and a second position, extending out of the distal tip and into the organ. The actuation and control means is capable of moving each needle between the first and second positions, both independent of the fiber optic element and in conjunction with the fiber optic element. By using a suction-irrigation device with the hollow needle, the hollow needle may serve as a vehicle to aspirate or irrigate the area receiving laser treatment, or the needle may completely withdrawn into the catheter shaft. A suction and irrigation device may also be used in communication with the needle receiving lumen in the catheter shaft to provide suction or irrigation in the passageway at the point where the fiber optic element enters the wall.

To support the needle during puncturing and insertion into the passageway wall means for temporarily fixing the catheter in the passageway is provided. This means comprises at least one inflatable dilation balloon surrounding at least part of the distal end of the catheter shaft and distal tip. A lumen is provided in the catheter shaft to direct an inflation fluid to the dilation balloon.

In one alternative embodiment the needle is provided with a steering fiber in order to guide the needle once it has entered the prostate. Tension induced in the steering fiber causes the needle to bend and thus change direction.

Brief Description of the Drawing

The features and advantages of the invention will be more readily apparent from the following detailed description of the preferred embodiments, illustrated in the drawing figures, wherein:

FIG. 1 is a schematic view of the apparatus of the present invention showing the catheter and ancillary devices;

FIG. 2 is a section view of the catheter tip of a preferred embodiment of the apparatus of the present invention;

FIG. 3 is a detailed view of a portion of FIG. 2 showing the needle and needle lumen;

FIG. 4 is a section view of the catheter tip of an alternative preferred embodiment of the apparatus of the present invention;

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FIG. 5 is a section view of an alternative embodiment of the distal tip and needle director channels according to the present invention;

FIGS. 6a and 6b are cross sectional views of the tip shown in FIG. 5, taken along lines 6a-6a and 6b-6b, respectively;

5 FIG. 7 is a section view of a preferred embodiment of a needle used in the apparatus of the present invention;

FIG. 8 is a section view of a steerable needle used in the apparatus of the present invention;

FIG. 9 is a cross sectional view of the needle of FIG. 8, taken along line 9-9;

10 FIG. 10 is a section view of the catheter tip according to an alternative preferred embodiment of the apparatus of the present invention; and

FIG. 11 is a section view of the catheter tip of a preferred embodiment of the apparatus of the present invention shown in transurethral insertion made with the needles and fiber optic element in various stages of deployment in prostatic tissue.

15 Detailed Description of the Preferred Embodiments

Shown generally in FIG. 1, the present invention includes catheter 1, which delivers a needle system (shown in detail in FIGS. 3 and 7-9) that places one or more fiber optic elements and thermo-measuring devices through the urethral or rectal wall and into the bulk of the prostate mass. Laser energy is then delivered by the fiber optic element to hyperthermally treat selected areas. For the purposes of clarity and conciseness, the detailed description is made with reference only to the urethra, rectum and prostate. This is not intended to be limiting of the present invention, as it will be readily appreciated that the present invention is useful for laser energy delivery to any organ or body part adjacent to a passageway accessible by a catheter.

20 Catheter 1 has a semi-rigid or flexible shaft 2 ending at distal tip 3 and beginning at proximal end 5. The diameter of catheter 1 may be small enough to allow it to be inserted down the shaft of a known urethroscope, proctoscope or resectoscope. Alternatively, catheter 1 may be much larger without departing from the scope of the invention; and, thus be inserted directly into the rectum or urethra.

30 Needle control cable 9 extends from proximal end 5 and connects the needle system to an external needle actuation and control means 8. In practice, the configuration of needle control cable 9 will vary depending on the particular

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embodiment of the invention used. These variations will be apparent to persons skilled in the art based on the description of the alternative embodiments below.

In addition to needle actuation and control means 8, one or more of the following devices are used to assist in positioning and operating the invention: laser
5 energy source 11, suction-irrigation device 12, thermo-monitoring device 13, and
fiberoptic visualization apparatus 14. These devices cooperate with catheter 1 through
multi-device interface 10. The operation and function of each of these known devices
should be understood by those skilled in the art. The cooperation of each device with
the present invention will be better understood after the various components of the
10 present invention have been described in greater detail below.

FIG. 2 illustrates one preferred embodiment of the needle system and distal tip
3 of the present invention. Distal tip 3 is secured to the distal end 4 of catheter shaft
2. Needle 15 lies in needle lumen 16 within shaft 2. A long, spinal-type needle with
sufficient flexibility to follow the urethral or rectal passageway is shown. Any similar
15 long, fine needle may be used. Needle director channel 17 is provided in distal tip 3,
in communication with needle lumen 16. Director channel 17 opens on the periphery
of distal tip 3, through needle outlet 18.

When catheter 1 has been placed within the urethra or rectum, with distal tip 3
adjacent to the prostate, needle 15 may be advanced by actuation and control means
20 8. In practice, various actuation means are possible. A person of ordinary skill in the
art will recognize hydraulic, spring loaded, mechanical translational or rotational cable,
shape memory alloy, or electro-magnetic mechanisms as useful for this purpose. When
advanced, needle 15 extends from lumen 16 into director channel 17 and is thus curved
outward, toward the urethral or rectal wall and into the prostate.

25 The position of catheter 1 and extension of needle 15 may be observed using
various visualization means such as fluoroscopy, magnetic resonance spectroscopy,
proctoscopy, urethroscopy, transrectal ultrasound, and transurethral ultrasound.
Specific targeting of certain types of small lesions in the prostate (i.e., prostate cancer)
will require the use of interstitial guidance such as ultrasound, MRI or fluoroscopy.
30 More massive benign conditions, such as BPH, may not require such guidance.

To maintain the position of the catheter and dilate the urethra or rectum
(compress the prostate) while needle 15 is entering the prostate, one or more balloons
may be used. In the embodiment shown in FIG. 2, shaft balloon 20 and tip balloon 19

are used for these purposes. An inflation substance such as saline or air is delivered through lumens 22 and 21, respectively. By pressing against the passageway wall, the balloons fix the catheter to provide a firm base for supporting the needle as it punctures and enters the prostate.

5 Additionally, the effectiveness of the laser energy delivery can be increased by restricting blood flow to the tissue cells to be necrosed. For example, effective laser hyperthermia requires that the temperature of the target cells be raised to a minimum of about 42.5°C and maintained at that temperature for a specified period of time. Blood supply to the diseased target cells acts as a heat sink that absorbs thermal
10 energy and prevents those cells from being heated sufficiently. The heat sink effect prevents the target cells from reaching the desired temperature without raising the temperature of surrounding normal tissue cells high enough to cause damage. The dilation balloon(s) press against the prostate to restrict blood flow to the target cells and reduce the unwanted heat sink effect.

15 The details of needle 15 are best seen in FIG. 3. Fiber optic element 23 is slideably received in lumen 32 in the needle. In a preferred embodiment, fiber optic element 23 is simply a bare optical fiber. Modifications such as cladding and shaped ends may be used (see FIG. 8). One or more thermo-measuring devices are attached to element 23 to monitor the temperature
20 at the energy delivery location. For this purpose two thermocouples 24 are shown in FIG. 3. Fiber optic thermo-measuring devices also may be used. The leads for thermocouples 24 are attached to fiber optic element 23 and lie within lumen 32. Lumen 32 also may be used for aspiration or irrigation.

FIG. 7 illustrates a possible alternative embodiment for needle 15. Instead of
25 being formed as a single piece, the needle shown in FIG. 7 has a sharpened needle tip 34 joined to a flexible needle shaft 33 by joint 35. Tip 34 is made of medical grade stainless steel and sharpened to a razor-like edge. Shaft 33, as are all other components, is made of standard bio-compatible plastic which may be selected by those of ordinary skill in the art. Again, central lumen 32 is provided within the needle
30 to carry the fiber optic element and allow for aspiration or irrigation.

FIG. 4 illustrates an alternative embodiment of the present invention wherein the dilation and fixation means is formed as a single balloon 19a surrounding distal tip 3 and proximal end 4 of catheter shaft 2. Needle outlets 18 are provided in balloon 19a

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to allow the needles to pass from director channels 17 into the prostate. Balloon 19a is inflated by one or more fluid lumens 21. This configuration concentrates the blood restricting and supporting effects of balloon 19a around the point of entry of the needles into the prostate.

5 Distal tip 3, shown in FIG. 1, is provided with a single needle director channel 17 for a single needle. It will be readily appreciated that multiple needles may be utilized, with the number being restricted only by the diameter of catheter 1. FIGS. 5 and 6 illustrate an alternative embodiment of a distal tip 3a having five director channels 17 to accommodate five separate needles. The five separate director channels 17
10 alternatively may communicate with a single large lumen in catheter shaft 2 or director channels 17 may individually communicate with five separate needle lumens provided in catheter shaft 2.

Referring to FIGS. 8 and 9, a steerable needle according to the present invention may be described. In this embodiment, a needle steering fiber 39 is provided within
15 lumen 32. Steering fiber 39 exits the needle through opening 40 near the needle tip. Steering fiber 39 is fixed to the needle adjacent the sharpened tip at joint 41. Tension induced in steering fiber 39 causes the needle to bend due to the eccentric positioning of the steering fiber within lumen 32. This bending allows the surgeon to steer the needle to the precise spot where hyperthermia is required, after the needle has
20 punctured and entered the prostate.

FIG. 8 also illustrates a possible embodiment of fiber optic element 23. As shown in FIG. 8, optical fiber 36 is provided with cladding 38 and spherical end 37 in order to dissipate the laser energy over a wider angle at the point of delivery. Cladding 38 is standard, commercially available optical cladding.

25 FIG. 10 shows a further alternative embodiment of the catheter distal tip 3 according to the invention. In this embodiment, needle 15 is advanced forward by manipulation of cable 25, attached at the proximal end of needle 15. The correct movement of needle 15 is ensured by bearing 26, which moves with needle 15 and rides smoothly in track 27. Needle port 18a may have a breakthrough covering or may
30 be exposed as shown.

In order to finally position needle 15, catch 28 is retracted by cable 31 and bearing 26 is pushed past the catch. Cable 31 is then released and compression spring 29 causes catch 28 to hold needle 15 in place due to its biasing action around

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pivot 30. Thus, catch 28 adds both directional assistance and provides resistance to maintain needle 15 in position. The needle may be definitively locked in position by locking cable 31. Spring 29 may be a plastic or metal spring.

Attached at the base of needle 15 is an aspiration/irrigation lumen 32 which
5 allows the needle to introduce the fiber optic element 23 (with thermocouples 24) and act as an irrigation or suction vehicle.

The overall operation of the present invention may be explained by reference to FIG. 11. Catheter 1 is inserted into the urethra 42 (or rectum) and placed adjacent to the area of the prostate 43 where delivery of laser energy is desired. Shaft balloon 20
10 and tip balloon 19 (inflated at 19") are inflated as required to secure the position of catheter 1 and compress the prostate. As shown in FIG. 11, catheter 1 employs distal tip 3a (FIG. 5) and needles 15 are formed in two parts as shown in FIG. 7.

FIG. 11 shows the present invention at two different stages of operation. In the top half of FIG. 11, needle 15' has just been extended to puncture the urethral wall and
15 enter the prostate 43. As needle 15' is moved into the prostate, it carries with it fiber optic element 23', with thermocouples 24 attached. Once the needle 15' has moved to the desired location in the prostate, the needle may be either withdrawn, leaving the fiber optic element 23' in place, or remain in position to act as a irrigation or suction vehicle. If vaporization is to be employed, aspiration through the needle is necessary
20 to remove gasses produced. Control and actuation means 8 is used to control the position of the fiber optic elements with respect to the needles and to control the position of both with respect to the catheter. If necessary, irrigation or aspiration may be conducted through needle lumen 16, director channel 17 and needle outlet 18 which opens into the urethra 42 (or rectum). Aspiration or irrigation for both the needle and
25 the catheter is provided by suction-irrigation device 12.

As shown in the bottom half of FIG. 11, needle 15" has been withdrawn into needle lumen 16, leaving fiber optic element 23" in place in the prostate 43. In this embodiment, fiber optic element 23" comprises optical fiber 36 surrounded by cladding
30 38. Optical fiber 36 has a plain end, and thermocouples 24 are mounted in cladding 38. Laser energy is provided to the fiber optic elements from laser energy source 11 by known means. Thermocouples 24 are connected to thermo-monitoring device 13, which monitor the temperature of the area being treated in order to precisely control the energy delivery.

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After the delivery of laser energy is complete, the fiber optic elements may be repositioned by further extension of the associated needles or by withdrawing the elements and repositioning catheter 1. Alternatively, if a steerable needle is used (such as shown in FIG. 8), the needle may be significantly repositioned without moving
5 catheter 1. After energy delivery is complete, all needles and fiber optic elements are withdrawn and catheter 1 is completely withdrawn from the body.

The structure of the present invention also promotes recovery for the patient after the procedure is complete. Due to deep ablation of the tissue and the mode of delivery, only small needle-size puncture holes remain in the urethra. These will heal
10 quickly, leaving the remaining deep necrotic tissue to sluff and be absorbed subepithelially. Any liquefied or vaporized materials may be suctioned while the needles are still in place. No drainage catheter is needed postoperatively and the procedure may be done on a one day surgery basis.

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CLAIMS

1. Apparatus for laser energy delivery to an organ adjacent to a body passageway, characterized by:

a fiber optic element having a distal end for delivering laser light to an area of
5 the organ to be treated;

hollow needle means for puncturing the passageway wall and organ and for carrying the fiber optic element through the puncture to the area of the organ to be treated, said fiber optic element slidably disposed within said needle means allowing relative axial movement between said element and needle means, said needle means
10 being retractable separate from said element to expose the distal end of the fiber optic element to the area to be treated; and

catheter means for delivering said optical fiber optic element inside said needle means, to a position in the passageway adjacent to the organ to be treated.

2. Apparatus according to claim 1, wherein said catheter means is
15 characterized by:

a tubular body having a distal end and a proximal end and defining a needle lumen for slideably receiving said needle means and

means for directing said needle means into the organ, including a channel communicating with the needle lumen and opening to the body passageway;

20 and

suction-irrigation means communicating with said needle lumen for alternately aspirating and irrigating the passageway around the puncture as desired.

3. Apparatus according to claim 1, wherein

said needle means includes at least one tubular shaft needle having a
25 sharpened distal end for puncturing the passageway wall and organ;

said tubular shaft needle defines a lumen for slideably receiving the fiber optic element; and

said lumen communicates with suction-irrigation means for alternately aspirating and irrigating the area of energy delivery as desired.

4. Apparatus according to claim 3, wherein said tubular shaft needle is
30 characterized by a metal, sharpened needle tip joined to a flexible shaft.

5. Apparatus according to claim 3, wherein said needle is individually steerable.

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6. Apparatus according to claim 5, wherein said needle includes:

a peripheral opening defined by the tubular shaft spaced proximally from the distal end of the needle; and

a steering fiber received in said needle lumen, and exiting said needle lumen through said peripheral opening, with said fiber being joined to the needle adjacent to the sharpened distal end, whereby the needle may be bent and steered by inducing tension in said steering fiber.

7. Apparatus according to claim 1, wherein:

said needle means includes a plurality of individual tubular shaft needles, each needle having a sharpened distal end for puncturing the passageway wall and organ, and each needle defines a lumen for slideably receiving a fiber optic element; and

said catheter means is characterized by:

a tubular body having a proximal end and a distal end and defining a plurality of needle lumens equal in number to the number of said plurality of needles, with one needle slideably received in each needle lumen,

a cylindrical distal tip attached the distal end of the tubular body, said distal tip having a plurality of curved channels equal in number to the number of needle lumens, each curved channel communicating with one needle lumen at the distal end of the tubular body and opening at needle outlets along the periphery of the distal tip to provide means for directing said needles into the organ, and

means for temporarily fixing the tubular body and distal tip in the passageway relative to the passageway wall.

8. Apparatus according to claim 7, wherein said fixation means is characterized by:

a first inflatable dilation balloon circumferentially surrounding the tubular body, disposed proximally relative to the needle outlets in the distal tip;

an inflation lumen provided in said tubular body communicating with said first balloon;

a second inflatable dilation balloon disposed at the distal end of the distal tip; and

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an inflation lumen provided in said tubular body and extending through said distal tip in communication with the second balloon.

9. Apparatus according to claim 7, wherein said fixation means is characterized by:

5 an inflatable dilation balloon surrounding the distal tip and a distal portion of the tubular body, said balloon having a number of needle passageways equal to the number of needles, each needle passageway being aligned with and communicating with one of the needle outlets; and

10 an inflation lumen defined by the tubular body and communicating with the balloon.

10. Apparatus according to claim 1, wherein said fiber optic element is characterized by an optical fiber surrounded by optical cladding with a thermo-measuring device provided coaxially with said optical fiber.

15 11. Apparatus according to claim 10, wherein said optical fiber has a spherical distal end.

12. Apparatus according to claim 1, wherein said fiber optic element consists of a bare optical fiber with at least one thermo-measuring device provided thereon.

13. Apparatus according to claim 12, wherein said optical fiber has a spherical distal end.

20 14. Apparatus according to claim 1, further comprising means for actuating and controlling said needle means to move said needle means between a first position, sheathed within said catheter means, and a second position, extending out of said catheter means and into the organ to be treated, said actuation and control means being capable of moving said needle means between said first and second positions
25 both independent of said fiber optic element and in conjunction with said fiber optic element, whereby said fiber optic element may be selectively positioned and repositioned in said organ by mechanically puncturing said organ as required.

30 15. The apparatus of claim 14 wherein the needles are actuated by means selected from the group consisting of hydraulic, spring loaded, mechanical translational cable, mechanical rotational cable, electromagnetic, and shape memory alloy.

16. Apparatus according to claim 1, wherein:
said hollow needle means is characterized by:

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a rigid distal needle portion having a proximal end and a sharpened distal end, said rigid portion defining a hollow passage for said fiber optic element,

a bearing mounted on said rigid needle portion,

5 a flexible control and actuation cable attached to the proximal end of the rigid portion, and

structure defining a lumen attached to the proximal end of the rigid portion, said lumen communicating with the hollow passage, slidably carrying said fiber optic element and providing means for aspirating and irrigating the area of energy delivery; and

10

said catheter means is characterized by:

a tubular body defining a needle lumen slideably receiving said actuation cable and lumen structure,

15

a cylindrical distal tip joined to the tubular body, said tip defining an internal channel communicating with said needle lumen and opening via a needle outlet on the periphery of the distal tip,

track means for receiving and guiding said bearing in said distal tip, said track means configured to guide the sharpened distal end of said rigid needle portion out of said needle outlet when said control and actuation cable is moved distally, and

20

means for selectively locking said rigid needle portion in a position extending out of said needle outlet.

17. Apparatus according to claim 16, wherein the rigid needle portion is stainless steel and the sharpened distal end has a razor-sharp edge.

25

18. Apparatus for laser energy delivery to an organ adjacent to a body passageway, characterized by:

at least one fiber optic element having a distal end for delivering laser light from a laser energy source to an area of the organ to be treated;

30

at least one tubular shaft needle having a sharpened distal end for mechanically puncturing the passageway wall and organ and for carrying said at least one fiber optic element through the puncture to the area to be treated, wherein said needle defines a lumen slideably receiving said at least one fiber

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optic element for relative axial movement between said element and said needle;

5 catheter means for delivering said at least one needle and fiber optic element to a position in the passageway adjacent to the organ to be treated, said catheter means being characterized by a tubular body having a distal end and defining at least one needle lumen receiving said at least one needle, said catheter means further comprising means for directing said at least one needle into the organ including at least one channel communicating with said at least one needle lumen and opening on the periphery of the tubular body;

10 means for individually actuating and controlling said at least one needle to move said needle between a first position, sheathed within said at least one needle lumen, and a second position extending out of said catheter means tubular body and into the organ to be treated, said actuation and control means being capable of moving said at least one needle between said first and second positions, both independent of said at least one fiber optic element received in
15 said needle, and in conjunction with said fiber optic element, whereby said at least one fiber optic element and said at least one needle may be selectively positioned in said organ; and

means for temporarily fixing said tubular body and distal tip in said
20 passage way to provide support for said at least one needle when puncturing the passageway wall and organ.

19. Apparatus according to claim 18, wherein said lumen defined by said at least one needle communicates with suction-irrigation means for alternately aspirating and irrigating the laser treated area as desired.

25 20. Apparatus according to claim 18, wherein said at least one needle lumen in the catheter tubular body communicates with suction-irrigation means for alternately aspirating and irrigating the passageway wall adjacent to the puncture.

21. Apparatus according to claim 18, wherein said fixation means is characterized by:

30 a first inflatable dilation balloon circumferentially surrounding the tubular body, disposed proximally relative to said at least one channel opening in the tubular body;

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an inflation lumen provided in said tubular body communicating with said first balloon;

a second inflatable dilation balloon disposed at the distal end of the tubular body; and

5 an inflation lumen provided in said tubular body in communication with the second balloon.

22. Apparatus according to claim 18, wherein said fixation means is characterized by:

10 a dilation balloon surrounding the distal end of the tubular body, said balloon having at least one needle passageway aligned with and communicating with said at least one channel opening of the directing means; and

an inflation lumen defined by the tubular body and communicating with the balloon.

23. Apparatus according to claim 18, comprising five fiber optic elements, 15 five tubular shaft needles, five needle lumens and five director means channels.

24. Apparatus according to claim 18, comprising five fiber optic elements and five tubular needles received in a single needle lumen communicating with five director means channels for individually receiving each of said needles.

25. A catheter device for laser energy delivery to the prostate by insertion 20 into the urethra or rectum, characterized by:

at least one fiber optic element for delivering laser light from a laser energy source to the area of the prostate to be treated;

25 at least one hollow needle defining a lumen receiving said at least one fiber optic element, the number of needles equalling the number of fiber optic elements, said at least one needle having a sharpened distal end for mechanically puncturing the urethra or rectum and entering the prostate to carry said at least one fiber optic element received in said needle to an area to be treated, said fiber optic element being slidably disposed within said needle allowing relative axial movement between said element and needle, said needle 30 being retractable separately from said element;

a flexible catheter shaft for insertion into the urethra or rectum, said shaft having a distal end and a proximal end and defining at least one needle lumen for slideably receiving said at least one needle;

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a cylindrical distal tip attached to the distal end of the catheter shaft, said tip having means for directing said at least one needle out of the catheter in an oblique direction with respect to said distal tip, whereby said at least one needle may be guided into the prostate, said directing means including a channel in said tip communicating with said at least one needle lumen for passage of said

at least one needle, said channel opening along the periphery of the distal tip; means for actuating and controlling said at least one needle to move said at least one needle between a first position, sheathed within said catheter shaft and distal tip, and a second position, extending out of said distal tip and into the prostate, said actuation and control means being capable of moving said at least one needle between said first and second positions, both independent of said fiber optic element and in conjunction with said fiber optic element, whereby said fiber optic element may be selectively positioned and repositioned in the prostate by further mechanically puncturing the prostate as required;

means for temporarily fixing said catheter in the urethra or rectum to provide support for said needle when entering the prostate, said means comprising an inflatable dilation balloon surrounding at least a portion of the distal end of the catheter shaft, with a lumen defined by the catheter shaft for supplying an inflation fluid to the balloon; and

suction-irrigation means, communicating with the lumen defined by said at least one needle and with the needle lumen defined by the catheter shaft, for alternately aspirating and irrigating the area treated by the laser and an area adjacent to the puncture in the urethra or rectum.

26. A method for laser energy delivery to an organ adjacent to a body passageway, characterized by the steps of:

inserting into the passageway an apparatus including a catheter incorporating laser energy transmitting means, characterized by at least one fiber optic element carried within said catheter inside at least one moveable hollow needle, for transmitting laser energy to prostatic tissue;

positioning the catheter such that a tip thereof is approximately adjacent to the organ to be treated;

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5 deploying said at least one moveable hollow needle housed in the catheter and carrying said laser energy transmitting means such that said at least one needle mechanically punctures the passageway wall and penetrates into the organ to bring said laser energy transmitting means into contact with the area to receive energy deliver;

 selectively positioning said at least one hollow needle between a fully extended position and a position fully withdrawn into said catheter, while leaving said transmitting means fiber optic element in the organ;

10 energizing the laser energy transmitting means;
 directing laser energy onto the receiving area;

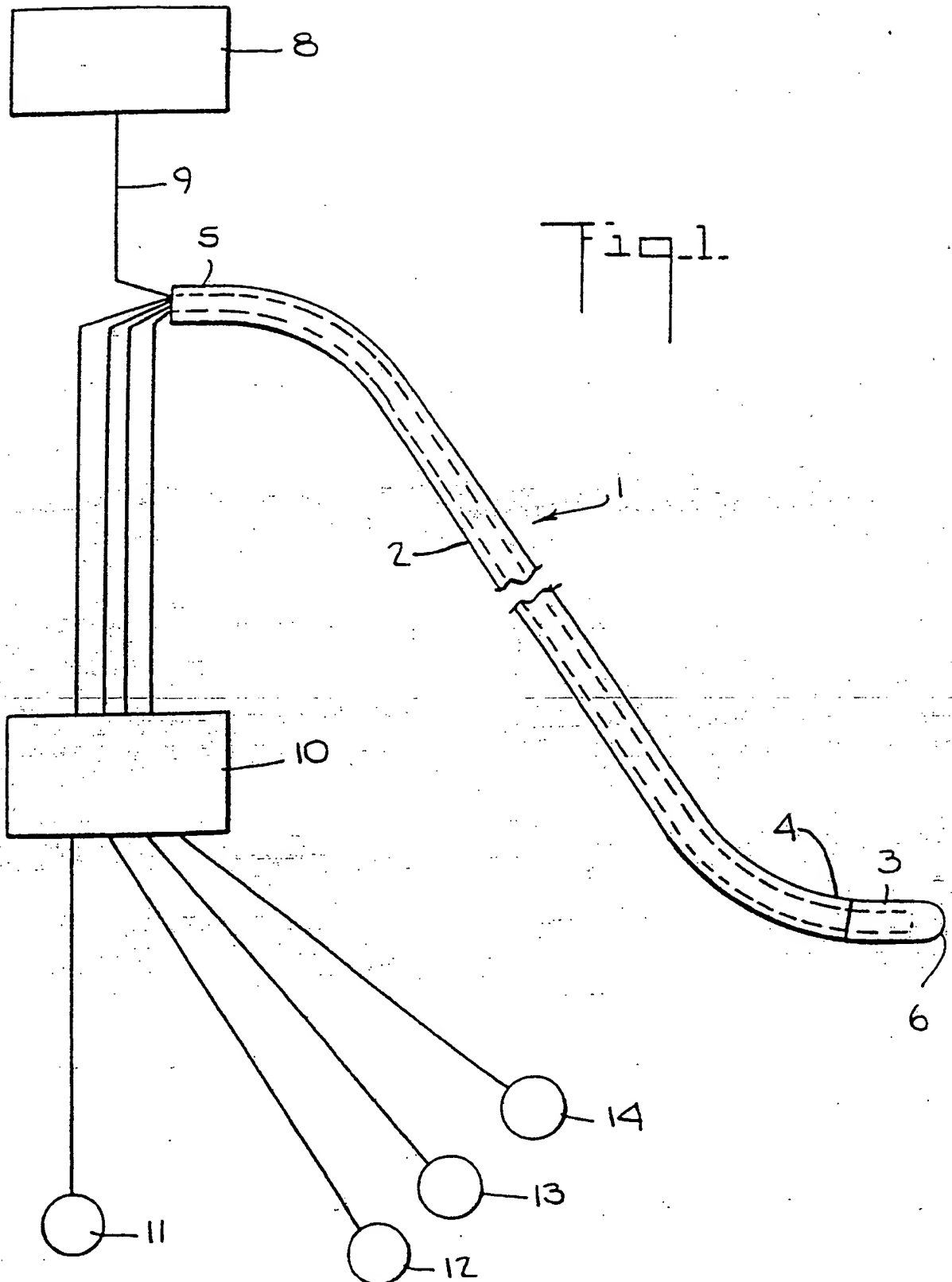
 aspirating and irrigating through said at least one hollow needle as required to remove tissue, liquids and vapor in the area of the organ receiving energy delivery;

15 terminating energization of the laser energy transmitting means after the desired energy delivery is achieved;

 retracting said transmitting means from the prostatic tissue into the catheter; and

 withdrawing the catheter.

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Fig. 2.

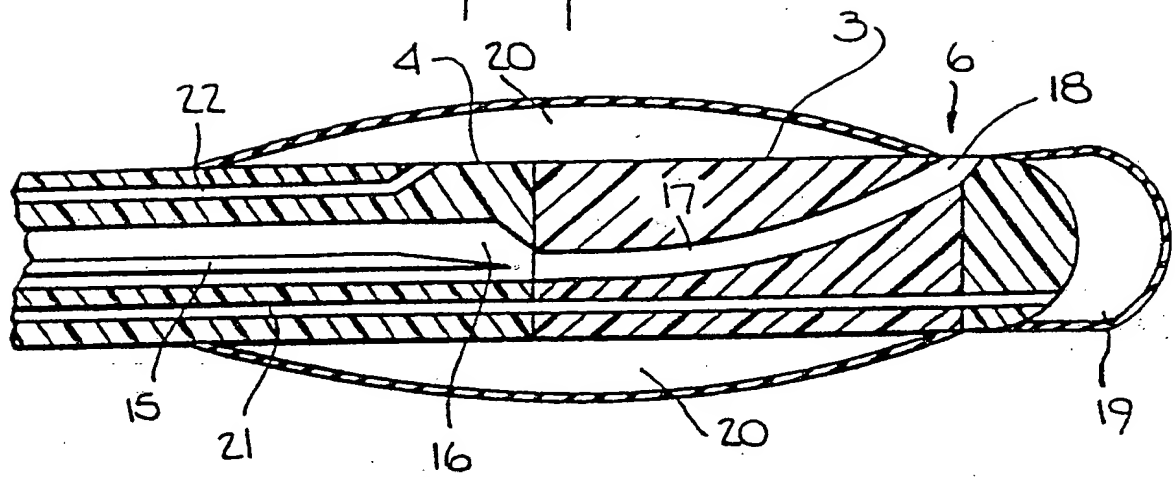
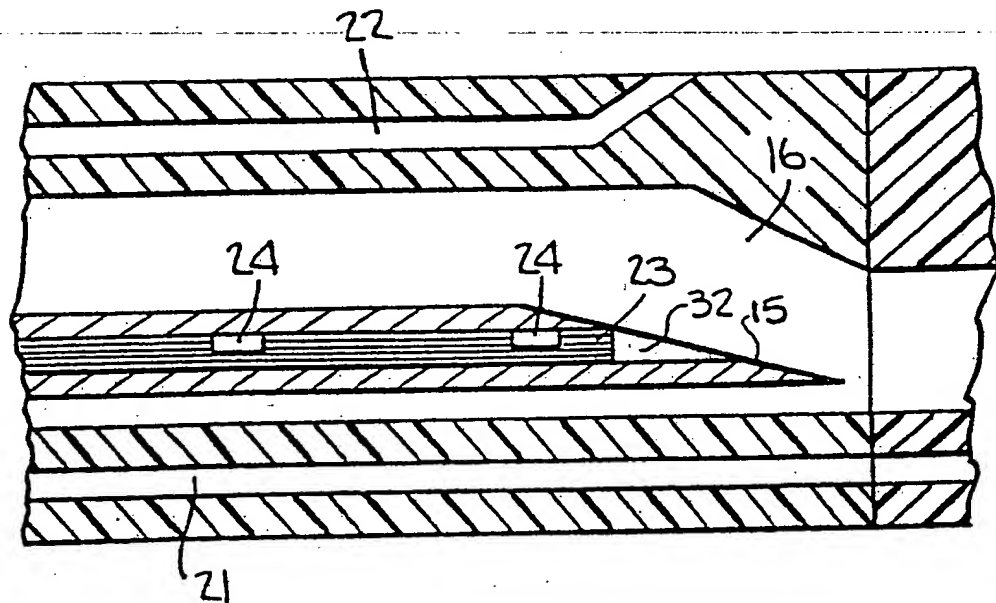


Fig. 3.



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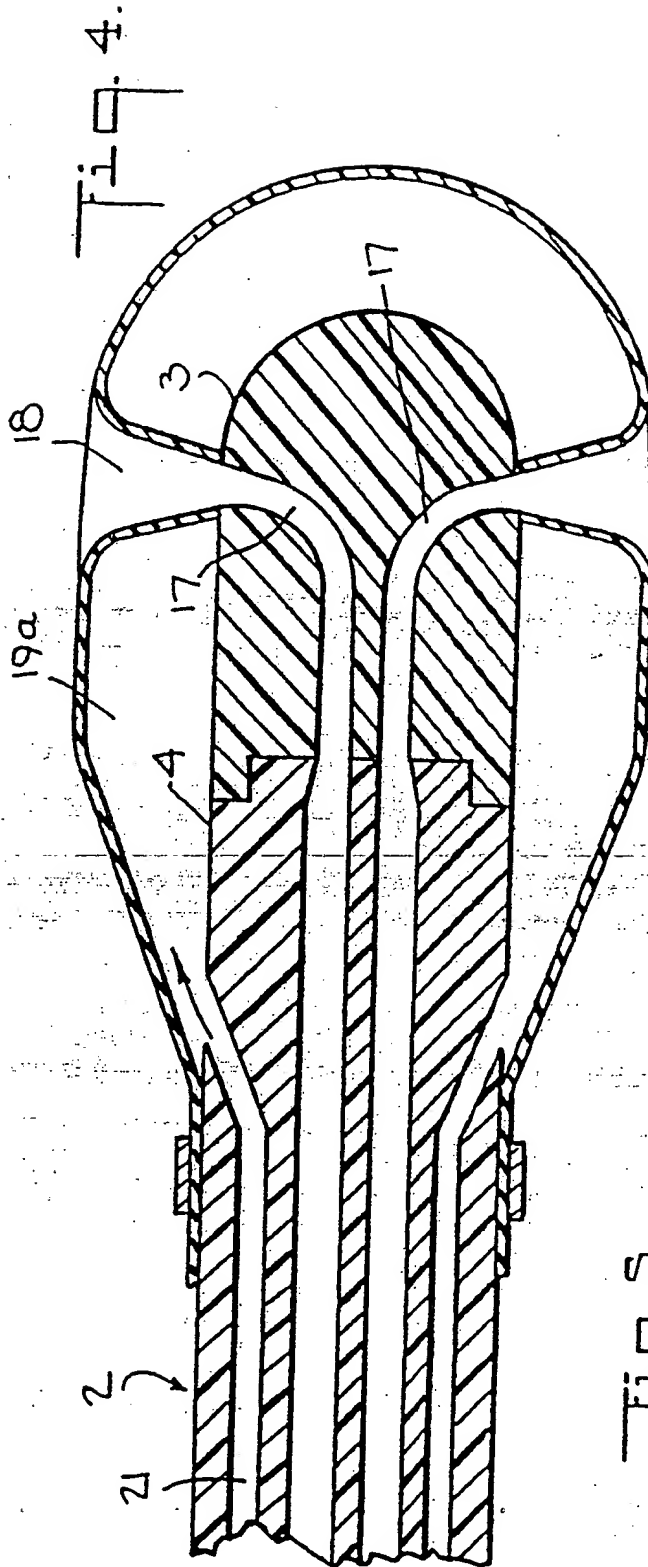


Fig. 4.

Fig. 5.

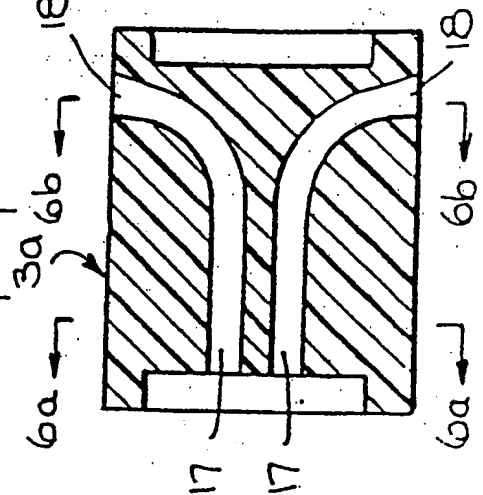
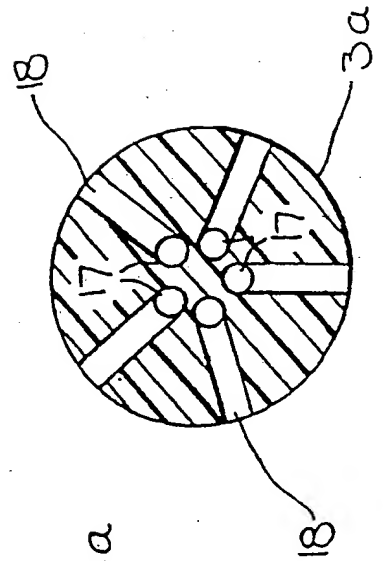
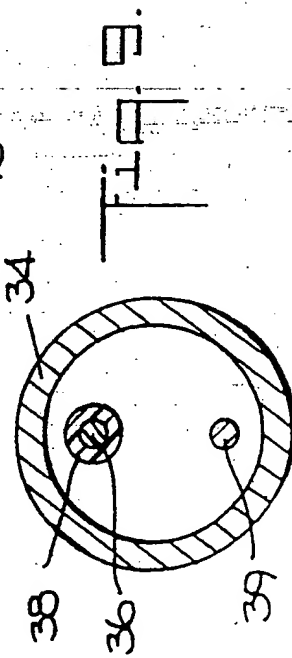
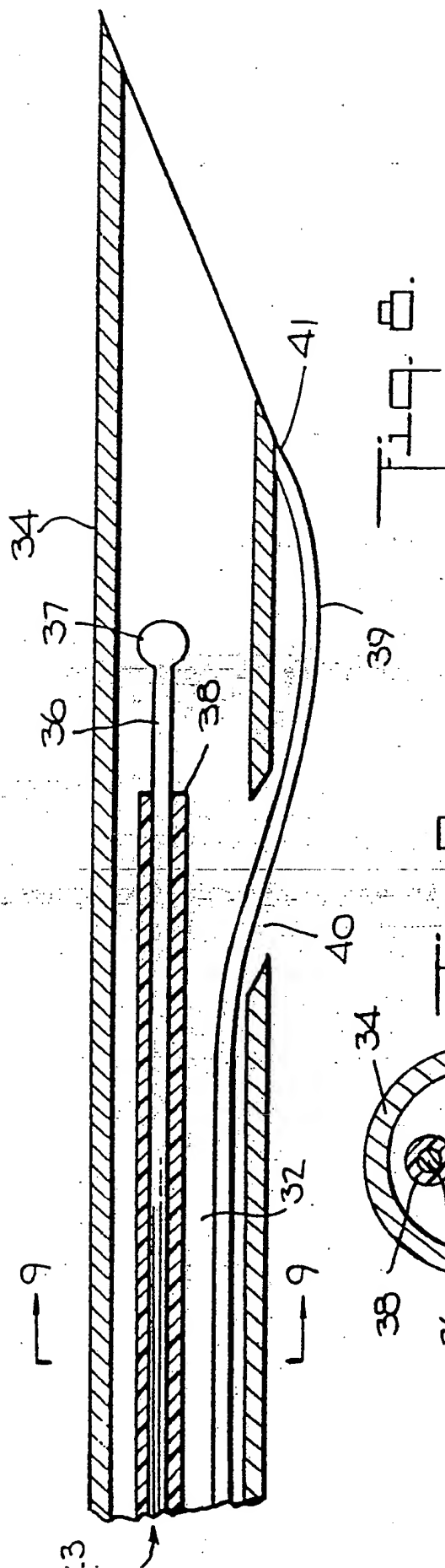
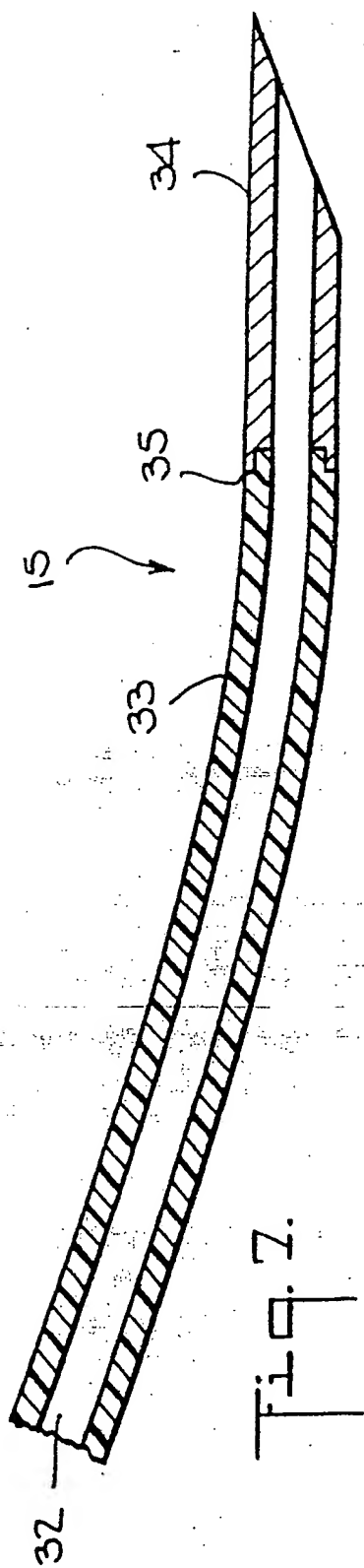


Fig. 5a.

Fig. 5b.





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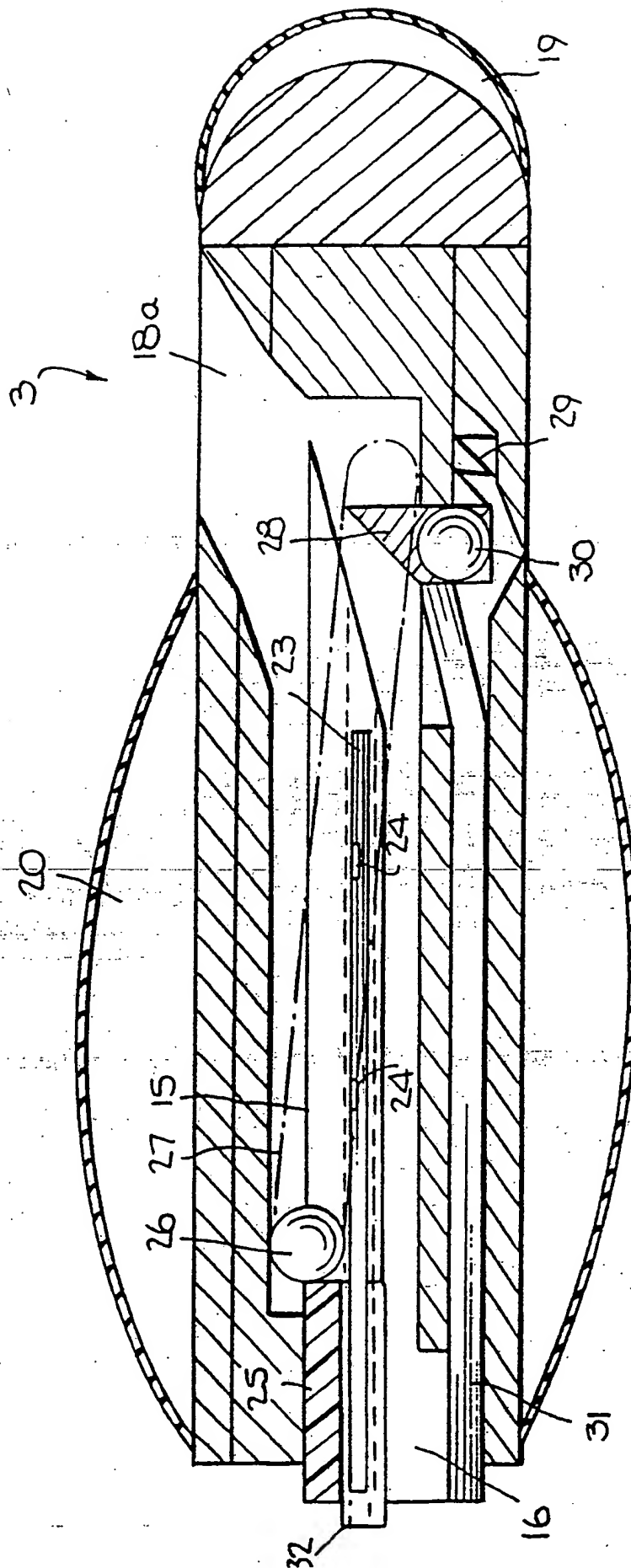
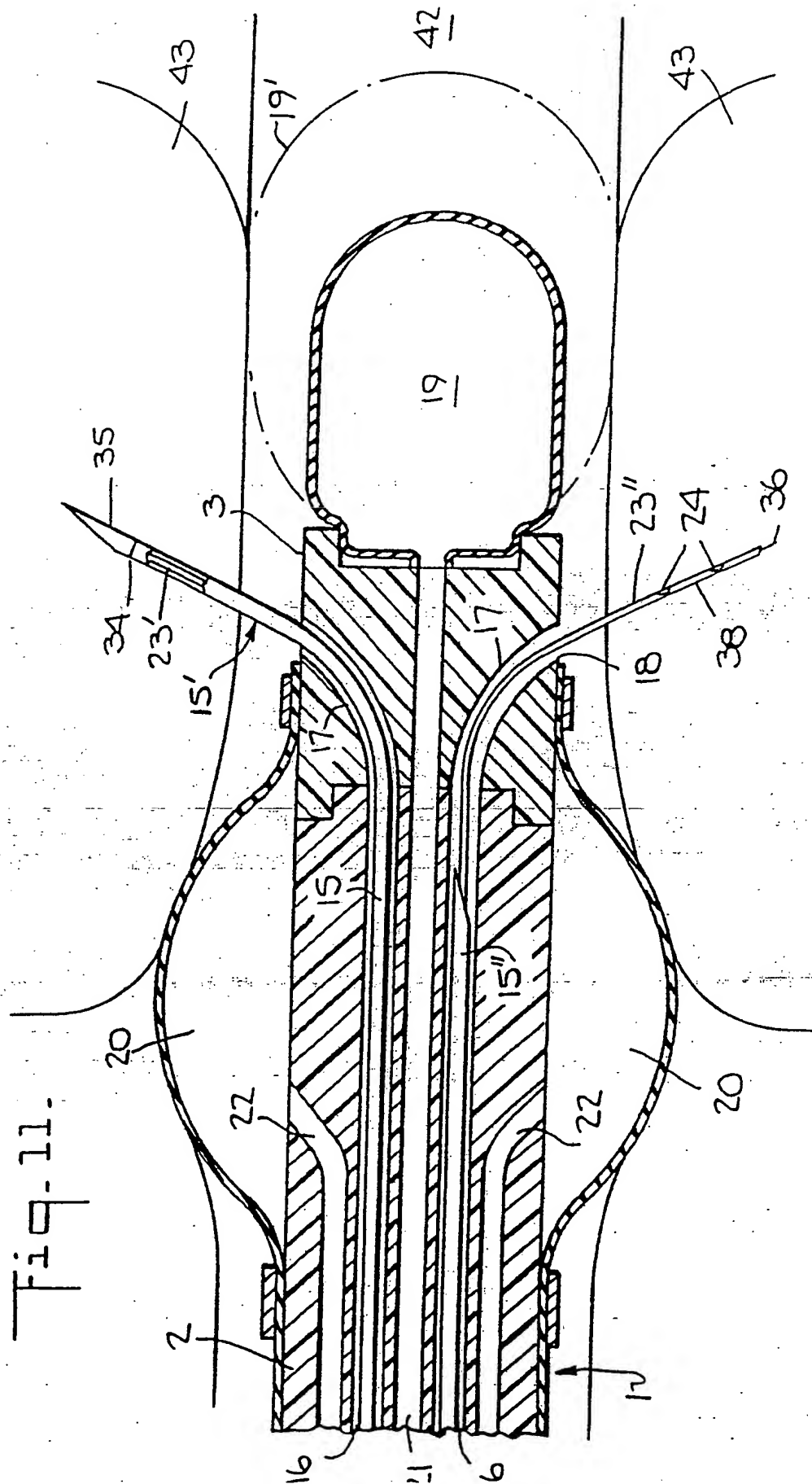


Fig. 10.



INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 91/08388

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC
 Int.Cl.5 A 61 B 17/36

II. FIELDS SEARCHED

Minimum Documentation Searched⁷

Classification System

Classification Symbols

Int.Cl.5

A 61 B

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸

III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
1 A	DE,A,2826383 (EICHLER et al.) 20 December 1979, see page 5, line 31 - page 6, line 1; figures 5,6 ----	1,18,25
1 A	US,A,4950267 (ISHIHARA et al.) 21 August 1990, see column 2, lines 58,59; figure 2 (cited in the application) ----	1,18,25
1 A	DE,A,3840749 (KOSCHER et al.) 7 June 1990, see column 3, lines 49-64; figures 1,2 ----	1,18,25
1 A	US,A,4955882 (HAKKY) 11 September 1990, see column 4, lines 34-37 ----	25
1 A	US,A,4760840 (FOURNIER, Jr. et al.) 2 August 1988 -----	

¹⁰ Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

20-03-1991

Date of Mailing of this International Search Report

28.04.92

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer



Els Vonk

V. ☒ **OBSERVATION WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE** ¹

This International search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claim numbers 26 because they relate to subject matter not required to be searched by this Authority, namely:

PCT-Rule 39.1(iv) Method of treatment of the human body.

2. ☐ Claim numbers because they relate to parts of the International application that do not comply with the prescribed requirements to such an extent that no meaningful International search can be carried out, specifically:

3. ☐ Claim numbers because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a):

VI. ☐ **OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING** ²

This International Searching Authority found multiple inventions in this International application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International search report covers all searchable claims of the International application
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this International search report covers only those claims of the International application for which fees were paid, specifically claims:
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

US 9108388

SA 54356

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 08/04/92
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A- 2826383	20-12-79	None	
US-A- 4950267	21-08-90	JP-A- 1139081	31-05-89
DE-A- 3840749	07-06-90	None	
US-A- 4955882	11-09-90	US-A- 5061266	29-10-91
US-A- 4760840	02-08-88	None	

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Patent application filing particulars including Serial No. and Filing Date.

SHELL-A.PAT

Rule 62 continuation of patent application filing particulars including Serial No. and Filing Date.

SHELL-A.62

Letter notifying WM. WRIGLEY JR. COMPANY of Serial No. and Filing Date.

WRIGLEY.SN

Transmission of patent Assignment.

SHELL-B.PAT

Notice of Patent No. and Issue Date.

SHELL-C.PAT

Transmittal of Original Letters patent with or without soft copies.

Paragraph requesting current address.

SHELL-D1.PAT

Use for William Webb letters when issued patent is being forwarded to a foreign associate.

DIPAT.WAW

Long established clients with permanent address.

SHELL-D2.PAT

DESIGN PATENTS - w/out maintenance fee paragraph.

SHELL-D3.DES

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SHELL-D.SFT

Transmittal of Original Certificate of Correction.

SHELL-E.PAT

Notification of foreign filing requirements.

FOREIGNF.LTR

Design Patent foreign filing requirements.

FOREIGND.LTR

WRIGLEY foreign filing notification.

WRIG-FFL.LTR

TRADEMARKS & SERVICE MARKS

Trademark application filing particulars including Serial No. and Filing Date.

SHELL-A.TM

Notice of Publication in Official Gazette:

Application based on actual use.

APR 22 2002

SHELL-B.TM

Application based on intent-to-use.

SHELL-B.2TM

Transmission of Trademark or Service Mark Assignment.

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December 22, 1994

Luke Dohmen, Esq.
Patent Attorney
SCIMED LIFE SYSTEMS, INC.
One SciMed Place
Maple Grove, Minnesota 44311-1566

APR 22 1994

Re: Our Case No. 3570/343 - Linden et al.
U.S. Application Serial No. 08/269,936
INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND
METHOD

Dear Mr. Dohmen:

The above-identified patent application is a Rule 62 continuation of U.S. Patent Application Serial No. 07/913,227 and is identical in specification, drawings and claims to our Case No. 3570/216 as of the close of prosecution. This application has been assigned Serial No. 08/269,936 and has an official filing date of July 1, 1994.

We will advise you as soon as the Patent and Trademark Office acts on this application.

Very truly yours,

Karl A. Vick

KAV/lms

FROM: DOCKET DEPARTMENT

RETURN TO

DATE: 3/11

APR 22 2002

Please prepare the form letter(s) identified below, proofread carefully, attach documents as indicated in specific letter, and give to lawyer for signature. After signature, the secretary will return signed letter to you and you must make copies for the file and mail out the original letter with appropriate enclosures.

ATTY. INITIALS	FORM LETTER DESCRIPTION	SHELL NAME
	Patent application filing particulars including Serial No. and Filing Date.	SHELL-A.PAT
	Rule 62 continuation of patent application filing particulars including Serial No. and Filing Date.	SHELL-A.62
	Letter notifying <u>WM. WRIGLEY JR. COMPANY</u> of Serial No. and Filing Date.	WRIGLEY.SN
	Provisional patent application filing particulars including Serial No. and Filing Date.	SHELL.PRO
	Transmission of Patent Assignment.	SHELL-B.PAT
	Notice of Patent No. and Issue Date.	SHELL-C.PAT
	Transmittal of original Letters patent <u>with or without</u> soft copies.	
	Paragraph requesting current address.	SHELL-D1.PAT
	Use for William Webb letters when issued patent is being forwarded to a foreign associate.	D1PAT.WAW
	Long established clients with permanent address.	SHELL-D2.PAT
	<u>DESIGN PATENTS</u> - w/out maintenance fee paragraph.	SHELL-D3.DES
	SOFT COPIES only.	SHELL-D.SFT
	Transmittal of Original Certificate of Correction.	SHELL-E.PAT
	Notification of foreign filing requirements.	FOREIGNF.LTR
	Design Patent foreign filing requirements.	FOREIGND.LTR
	WRIGLEY foreign filing notification.	WRIG-FFL.LTR
	<u>TRADEMARKS & SERVICE MARKS</u>	
	Trademark application filing particulars including Serial No. and Filing Date.	SHELL-A.TM
	Notice of Publication in <u>Official Gazette</u> :	
	Application based on actual use.	SHELL-B.TM
	Application based on intent-to-use.	SHELL-B.2TM
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TAV

MEMORANDUM

TO: Responsible Attorney KAU
FROM: GATT Compliance Committee
RE: GATT Review of U.S. Docket Files
U.S. Case No. 3570/343
DATE: May 10, 1995

APR 22 2002

The GATT Committee has used the firm's docket information to identify those cases that are most highly impacted by the new GATT patent law provisions. Those cases include:

1. continuation applications (file wrapper and otherwise)
2. continuation-in-part applications
3. divisional applications
4. applications on appeal
5. applications with a Final Office Action
6. applications pending more than two years
7. applications involved in an interference
8. applications with a restriction requirement

The above-noted case falls into one or more of these categories.

The responsible attorney should review the case file to determine if it is possible that another application claiming the benefit of the filing date of this application (and any parents thereof) will need to be filed to completely protect the client's invention disclosed in this application. If so, serious consideration should be given to filing such additional application(s) prior to June 8, 1995. That way, the new application will be entitled to a term of protection of at least 17 years (absent any terminal disclaimer).

If continuation applications are filed on or after June 8, 1995, resulting patents may have a term of less than 17 years. For example, if a restriction requirement has been entered in the case (either on the first Office Action or subsequently), a divisional application would probably best be filed prior to June 8. If a final rejection has been made, and a continuing case may be filed to submit new evidence or new amended claims, a continuation application filed before June 8 would assure a patent term of at least 17 years, even if the patent issues more than three years after the filing date of the earlier application to which a claim of benefit is made.

The responsible attorney should also consider whether the transitional rules (as now promulgated) may be used in this case. If so, there may be no need to file a continuation case before June 8, 1995.

Please indicate below whether a continuation application will be prepared at this time.

☐ I will file a continuation application by June 7, 1995.

☒ I have consulted with the client and have determined that there is no need to file a continuation application before June 8, 1995.

☐ I have already filed a continuation application on _____.

Karl Vich
(attorney signature)

6-5-95
(date)

Note: Please return the attached file, along with this completed form, to the U.S. Docket Department.

APR 22 2002

**WILLIAM BRINKS HOFER
GILSON & LIONE**

164861

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UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

DATE: 11/06/92

TO:

WILLIAN BRINKS OLDS HOFER GILSON & LIONE
GUSTAVO SILLER, JR., NBC TOWER
455 NORTH CITY FRONT PLAZA DRIVE
SUITE 3600
CHICAGO, IL 60610

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THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT BRANCH OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE U.S. PATENT AND TRADEMARK OFFICE ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT ASSIGNMENT PROCESSING SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT BRANCH, NORTH TOWER BUILDING, SUITE 10C35, WASHINGTON, D.C. 20231

ASSIGNOR:
LINDEN, BRADLEY C.

DOC DATE: 08/05/92

ASSIGNOR:
PALME, DONALD F., II

DOC DATE: 08/06/92

RECORDATION DATE: 08/26/92 NUMBER OF PAGES 004 REEL/FRAME 6241/0428

DIGEST :ASSIGNMENT OF ASSIGNORS INTEREST

ASSIGNEE:
SCIMED LIFE SYSTEMS, INC.
A CORPORATION OF MN
CITY OF MAPLE GROVE, MINNESOTA

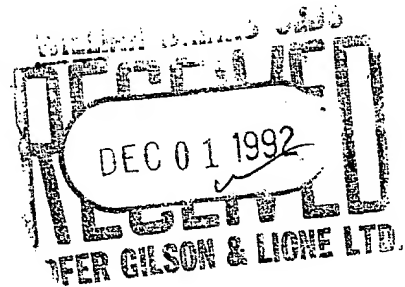
APR 22 2002

SERIAL NUMBER 7-913227
PATENT NUMBER

FILING DATE 07/14/92
ISSUE DATE 00/00/00

Jacqueline E. Moon

EXAMINER/PARALEGAL
ASSIGNMENT BRANCH
ASSIGNMENT/CERTIFICATION SERVICES DIVISION



1000 581 D



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August 21, 1992

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FACSIMILE 419 244-8862

GUSTAVO SILLER, JR.
(312) 321-4249

APR 22 2002

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Re: Applicants: Linden et al.
Title: INTRA-EXTRAVASCULAR DRUG
DELIVERY CATHETER AND METHOD
Serial No.: 07/913,227
Filed: July 14, 1992
Our File No. 3570/216

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Dear Sir:

Enclosed herewith, for recording in the United States Patent and Trademark Office, is an Assignment in the above-identified case to SciMed Life Systems, Inc.

Enclosed is a check for \$40.00 to cover the recording fee. The Commissioner is hereby authorized to charge any deficiencies in fees or charge any overpayment to Deposit Account No. 23-1925. A duplicate copy of this correspondence is attached.

Please return the recorded assignment to:

Gustavo Siller, Jr.
William Brinks Olds Hofer
Gilson & Liono
P.O. Box 10395
Chicago, Illinois 60610

Respectfully submitted,

Gustavo Siller, Jr.
Registration No. 32,305

GS/pdn
Enclosures

And the Assignors do hereby covenant and agree, for themselves and their legal representatives, that they will assist their Assignee in the prosecution of the application herein identified; in the making and prosecution of any other applications for Letters Patent that the Assignee may elect to make covering the invention herein identified, as hereinbefore set forth; in vesting in the Assignee like exclusive title in and to all such other applications and Letters Patent; and in the prosecution of any interference which may arise involving said invention, or any application or Letters Patent herein contemplated; and that they will execute and deliver to the Assignee any and all additional papers which may be requested by the Assignee to fully carry out the terms of this Assignment.

And the Commissioner of Patents and Trademarks is hereby authorized and requested to issue Letters Patent to the Assignee in accordance with the terms of this Assignment.

IN TESTIMONY WHEREOF, the Assignors have hereunto set their hands and affixed their seals.

DATE: August 5, 1992

Bradley C. Linden (SEAL)
Bradley C. Linden

DATE: AUGUST 6, 1992

Donald F. Palme II (SEAL)
Donald F. Palme II

6241

REEL

0430

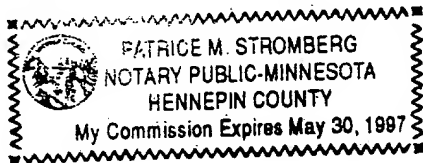
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STATE OF MINNESOTA)
) ss.
COUNTY OF Hennepin)

I, Patrice M. Stromberg, a Notary Public in and for the County and State aforesaid, do hereby certify that Bradley C. Linden, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that he signed, sealed and delivered the said instrument as his free and voluntary act for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and Notarial Seal, this 5th day of August, 1992.

(SEAL)



Patrice M. Stromberg
Notary Public

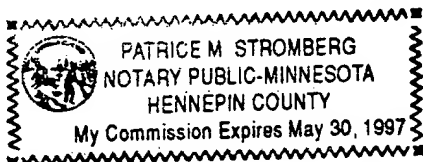
My Commission Expires: 5-30-97

STATE OF Minnesota)
) ss.
COUNTY OF Hennepin)

I, Patrice M. Stromberg, a Notary Public in and for the County and State aforesaid, do hereby certify that Donald F. Palme II, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that he signed, sealed and delivered the said instrument as his free and voluntary act for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and Notarial Seal, this 6th day of August, 1992.

(SEAL)



Patrice M. Stromberg
Notary Public

My Commission Expires: 5-30-97

- 3 -

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P A T E N T A C T I O N S D U E

Client-Matter No: 3,570-216 Country: US Sub Case:
Reference Number: 3570-216 Application No: 07/913,227
Supervising Atty: WAW Responsible Atty: GS
Title: INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD

Inventors: 1) LINDEN, BRADLEY C. 2) PALME II, DONALD F.

=====+=====		Action	Due	Indicator
US-ACTION		Due	Date	
Action Type: <u>US-ACTION 3 MON</u>				
Action Date: <u>12/30/92</u>				
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CLIENT/MATTER NO.:
(CASE NO.): *3570/216*

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Case No.
Applicant

3570/216
Bradley C. Linden
Donald F. Palmer II

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Please acknowledge receipt of the below-identified:

Patent Application Transmittal Letter (in duplicate), Specification (24 pages including Abstract), Drawings (5 sheets), check for filing fee, and postcard.



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By *Gustavo Siller, Jr.*

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Case No. 3570/216

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT

INVENTORS:

Bradley C. Linden
Donald F. Palme II

TITLE:

INTRA-EXTRAVASCULAR DRUG
DELIVERY CATHETER AND
METHOD

ATTORNEYS:

Gustavo Siller, Jr.
WILLIAN BRINKS OLDS HOER
GILSON & LIONE LTD.
P.O. Box 10395
Chicago, Illinois 60610
(312) 321-4200

INTRA-EXTRAVASCULAR DRUG
DELIVERY CATHETER AND METHOD

BACKGROUND OF THE INVENTION

The present invention relates to a drug delivery device and method for delivering a drug agent to a vessel or vessel-like lumen in the body. More particularly, the present invention relates to a drug delivery device and method wherein the drug agent is delivered to the vessel wall or to the outside of the vessel wall.

Obstructive atherosclerotic disease is a serious health problem facing our society today. This disease is the result of the deposit of fatty substances and cells and connective tissue on the interior of the walls of the arteries. The build-up or accumulation of such deposits results in a narrowing of the inside diameter of the artery which in turn restricts the blood flow through the artery. This disease, wherein the opening or lumen of the artery is narrowed, is known as atherosclerosis and the accumulation is known as a lesion.

One commonly used procedure for treating an obstruction caused by atherosclerosis is a procedure known as coronary artery bypass graft surgery ("bypass surgery"). Although bypass surgery has been used with moderate success in the treatment of atherosclerosis, it can be invasive and traumatic to the patient.

One less invasive and traumatic procedure developed more recently is coronary angioplasty. Coronary angioplasty, and angioplasty in general, is a procedure in which a balloon is positioned in the inside

of the artery at the site of the accumulation or lesion and inflated in order to dilate the atherosclerotic lesion and thus open the restricted area of the artery. In order to advance the balloon to the lesion, the balloon is attached to the distal end of a small diameter catheter, which includes means for inflating the balloon from the other end of the catheter. The catheter is maneuvered or "steered" through the patient's vessels to the site of the lesion with the balloon in an un-inflated form. When the un-inflated balloon is properly positioned at the lesion, the balloon is then inflated to dilate the restricted area.

While angioplasty has been relatively successful in treating coronary artery disease, restenosis of the treated site often occurs approximately 3 to 6 months following the procedure. It is believed that the primary factor in developing restenosis is the healing that takes place after the injury caused by the intervention of balloon dilation procedure. The restenosis has close analogy to scar formation following vascular surgery in that the histologic result has a similar morphology. The histologic response is called myointimal hyperplasia. The process of myointimal hyperplasia consists of the migration of smooth muscle cells through the internal elastic lamina into the vessel lumen where they then proliferate. The net result is a thickening of the vessel wall. Over time, this thickening reoccludes or restenoses the vessel to a point where it is clinically significant. That is, the blood flow through the vessel is diminished to a rate similar to the rate before the angioplasty procedure. The occurrence of this seems to happen approximately 30-35% of the time following an angioplasty to that specific site in coronary arteries.

Several alternative procedures have been attempted to try to affect the occurrence or rate of the restenosis following intervention to the lesion site in

the coronary artery. These procedures have included the use of lasers, mechanical atherectomy devices, heated balloons, and metal implantable stents. While each of these procedures has shown some success in dealing with the initial lesion, all have the similar problem of restenosis at a similar or even greater occurrence. Current estimates of restenosis of the lesion site using these alternative procedures ranges between 40-50%. The time frame of restenosis of all of these is generally from 3-6 months after the procedure.

Therefore, it appears that this restenotic healing lesion area is independent of the type of interventional procedure used. Rather, it is a physiologic response to any type of injury brought to that lesion site. Because of this intervention independent physiologic response, it is felt by many physicians that potentially the best way to deal with restenosis would be by a pharmacologic means, such as a drug agent, targeted at the biochemical events that take place after injury.

To date, most pharmacologic trials involve either an oral or intravenously injected drug that is delivered throughout the whole body in hopes of trying to effect this small site in the arteries. This type of pharmacologic treatment is known as a "systemic treatment." Some agents that have been tried in human clinicals include: heparin, calcium channel blockers, angiotensin converting enzyme inhibitors, Omega-3 fatty acids, and growth peptides. Other agents that may not have been tried in clinicals but are of interest include thromboxane synthetase inhibitor, serotonin, growth factor inhibitors, growth factor analogs such as angiopeptin, antagonists, HMGCoA reductase inhibitors, platelet derived growth factor, inflammatory cell factors, platelet aggregation inhibitors, and thrombin inhibitors such as hirudin or its analogs.

The indication for use of most of these has been either in in vitro-cell culture studies or animal studies. These studies have shown some effect on the smooth muscle cell proliferation and migration which are major components of the myointimal hyperplasia that takes place in the restenotic lesion. However, none of the systemic drug delivery human trials to date has shown a major effect on the occurrence of restenosis.

Even though none of these agents have been completely successful in the in-vivo human clinical trials, it is still generally felt that one of these agents or some other new agent, if delivered locally and site specifically to the lesion, would still be able to reduce the proliferative response. One of the problems with systemic techniques is the inability to deliver a high enough concentration of the agent locally at the lesion in order to effect the physiologic response. In the in-vitro and in-vivo animal studies which have shown some success, a high concentration of the agent was used. Thus, it is believed that if the agent was delivered specifically to the site as opposed to systemically, the agent may be delivered at a high enough concentration to truly effect the physiologic response.

The reason many of these agents have not been used in a higher concentration in-vivo in humans is that many of the agents may exhibit undesirable side effects. Thus, if a high concentration of the agents is given systemically, they may have unwanted physiologic effects. Therefore, if the drug can be given with high concentrations locally to the vessel wall while minimizing the systemic amount of drug, the desired result of modulating the restenotic growth while preventing any unwanted systemic effects may be achieved.

There are other ways known to date in trying to create a site specific local delivery of drug to a site. One approach presently contemplated is the use of a

perforated or sweating balloon. For example, a drug delivery device is disclosed by Wolinsky, H., et al. in the article entitled, Use of a Perforated Balloon Catheter to Deliver Concentrated Heparin Into the Wall of a Normal Canine Artery, 15 JACC 475 (Feb. 1990). This device is a percutaneous transluminal coronary angioplasty (PTCA) balloon with several microholes in the balloon for delivery of an agent during balloon dilatation. The drug is incorporated into the same fluid which is used to inflate the balloon.

A disadvantage of available devices, such as the one disclosed by Wolinsky et al., is that these devices cause a substantial blockage of blood flow in the subject vessel during the procedure. Thus, such devices may only be used for the fairly short time frame (typically, from one to two minutes), similar to the time frame of the actual angioplasty dilatation.

Other available drug delivery devices are disclosed, for example, in United States Patent Numbers 4,824,436 (Wolinsky) and 4,636,195 (Wolinsky). These devices are directed to a dual occlusion catheter in which a balloon is inflated proximally and distally of the accumulation or lesion creating a space for infusion of a drug. This dual balloon catheter creates a space for infusion of drug separate from the blood flow. This device, however, also can only be used for a short period of time because it occludes blood flow.

In these types of devices where a balloon is inflated inside the vessel, some means for providing perfusion through the catheter itself becomes important. It is necessary in such devices that the device provide a large latitude in time over which the agent could be delivered. Devices which occlude blood flow may not provide the necessary latitude. Because the basic research into the biochemistry and physiologic events indicate that the initial events begin immediately after

injury and continue intensely for several hours, it is desirable for the drug delivery system to allow drug delivery for several hours to a day or two beginning immediately after intervention. This research also points out that the initial events subsequently create a cascade of events that ultimately lead to intimal thickening. While these accumulations or lesions do not become apparent for several months, it is felt that if these initial events can be modulated, blocked, or even accelerated, then the subsequent cascade can be altered and a diminished overall thickening could be achieved.

Some devices have been designed which permit localized delivery of a drug agent while providing enhanced perfusion capabilities. For example, the drug delivery catheter disclosed in co-pending U.S. Patent Application Serial No. 07/740,045 filed on August 2, 1991, commonly assigned to the Assignee of the present application, provides an inflatable perfusion lumen which provides significantly more perfusion area than previous drug delivery devices. The disclosed catheter and method also provides drug delivery pockets on the outer periphery of the perfusion lumen. The pockets allow the drug agent to be delivered site specifically for extended periods of time.

All of the drug delivery devices discussed above, however, require that the device remain in the vessel while the drug agent is being administered. It would be desirable to have a technique for delivering a drug agent locally without the need for the drug delivery device to remain in the vessel.

To this end, some techniques have been proposed wherein a drug is delivered by a surgical procedure where a drug agent is delivered to the outside of a vessel to be treated. Studies have shown that during administration by implanting a controlled release device which surrounds the vessel (periarterial drug

administration) using drugs such as heparin-ethylenevinyl acetate significantly inhibited restenosis in an arterial injury model. See for example, Edelman et al., Proc. Natl. Acad. Sci. U.S.A., 87, 3773 (1990); and Edelman et al., J. Clin. Invest., 39, 65 (1992). In these types of procedures, access to the vessel is obtained by surgically cutting to the desired location in the vessel. Then the drug agent is maintained at the desired location by wrapping a band or cuff around the vessel with the agent being loaded into the band or cuff. Although periarterial drug administration has shown some initial success in an animal model, this procedure used for delivering the implant has the obvious disadvantage of being very invasive.

Therefore, it is desirable to have a drug delivery device capable of providing the necessary blood flow to the heart while the drug agent is being administered, which can be removed after the drug agent has been delivered and which is substantially less invasive than presently proposed techniques.

Such a device may also be extremely desirable in other procedures where a drug is to be delivered to a specific site in a vessel. For example, drug delivery devices may be useful in procedures where a drug or agent is used to dissolve the stenosis in an effort to avoid the use of angioplasty or atherectomy procedures altogether or to deliver a thrombolytic agent to dissolve a clot at the lesion site. Such a device may also be useful in the treatment of various disorders involving other vessels or vessel-like lumens in the body.

It will be recognized from this discussion that there is a need for a generic type of drug delivery system which emphasizes physician control over the device and agent. The device should have flexibility as to the agent that is to be delivered and should be capable of delivering any number of agents (either separately or at

the same time), or possibly also allow a change in the protocol of the delivery. It should also be flexible with respect to the time frame over which these agents would be delivered. It would also be desirable to have a device which can be removed from the vessel while the drug remains in place at the desired location.

Therefore, it is a primary object of the present invention to provide a device and method which can contain a relatively high concentration of a drug agent in a selected portion of a vessel, such as a blood vessel.

It is another object of the present invention to provide a device which can be removed after the agent has been delivered while the drug remains at the desired site.

It is a still further object of this invention to provide a device which is flexible as to the drug and the number of drugs or combination of therapeutic agents which can be delivered as well as the time frame over which they can be delivered.

SUMMARY OF THE INVENTION

To achieve these and other objects, the present invention provides a new and unique drug delivery catheter and method which may be inserted into a vessel, such as a blood vessel. The drug delivery technique of the present invention includes a catheter which comprises an elongated tubular shaft with an inner lumen and a vessel puncturing element which is housed in the lumen. The puncturing element has a retracted position such that it will not be in contact with the vessel wall as the catheter is guided through the vasculature. The puncturing element also has a puncturing position where it protrudes outwardly of the catheter shaft and engages and punctures the vessel wall.

First, the catheter is inserted into the area to be treated. The puncturing element is then moved to its puncturing position and the inner surface of the vessel wall is punctured. A drug agent is then delivered through the puncture in the wall. The drug agent may be delivered either into the vessel wall itself or outside of the vessel wall. Thus, the drug will remain at a treatment site and diffuse, preferably in a time released manner to the treatment area. The drug will remain at the delivered site even after the drug delivery catheter has been removed from the vessel.

In a preferred embodiment, the puncturing element comprises a needle which also functions as a tube to deliver the drug.

In a preferred embodiment, the techniques of the present invention involves the implantation of a biodegradable material loaded with the drug agent in close proximity to the extravascular side of the vessel where the implant will remain and release the drug agent over a period of time.

The present invention provides a device and method for drug delivery in relatively high concentrations and which can be used in a relatively flexible time frame depending on the particular form of the drug being delivered.

Additional objects, advantages and novel features of the invention will be set forth in part in the description which follows and in part will become apparent to those skilled in the art upon examination of the following or may be learned by practice of the invention. The objects and advantages of the invention may be obtained by means of the combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 shows side sectional view of an embodiment of the drug delivery catheter of the present invention.

FIGURE 2 shows an enlarged sectional view of the embodiment of FIGURE 1.

FIGURE 3 shows an enlarged section view of the embodiment of FIGURE 1 puncturing a vessel.

FIGURE 4 shows a cross-section of drug delivery catheter taken along line 4-4 of Figure 6.

FIGURE 5 shows a cross-section of the drug delivery catheter taken along line 5-5 of Figure 6.

FIGURE 6 shows an enlarged view of the puncturing area of the catheter of Figure 1.

FIGURE 7 shows a perspective view of a cam arrangement for the drug delivery catheter of the present invention taken along lines 7-7 of Figure 8.

FIGURE 8 shows a side sectional view of a cam arrangement for the drug delivery catheter of the present invention.

FIGURE 9 shows a side view of another embodiment of the drug delivery catheter of the present invention with an inflatable balloon.

FIGURE 10 shows a cross-section of the embodiment of FIGURE 9 along line 10-10.

FIGURE 11 shows an opening gauge for the catheter of the present invention.

FIGURE 12 shows another embodiment of the present invention with the puncturing element in the retracted position.

FIGURE 13 shows the catheter of the embodiment shown in FIGURE 12 with the puncturing element in the puncturing position.

FIGURE 14 shows another embodiment of the present invention with the puncturing element in the puncturing position.

FIGURE 15 shows another embodiment of a cam arrangement for the present invention.

FIGURE 16 shows an embodiment of a manifold which can be used with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now specifically to Figures 1-5, a preferred embodiment of the drug delivery catheter 20 of the present invention is illustrated. The drug deliver catheter comprises a tubular catheter shaft 21 which has a proximal end, connected to a manifold 32, and a distal end. The distal end of the catheter 20 is intended to be inserted into and placed at the treatment site in the vessel 23. The catheter shaft may be made of any suitable material such as a metallic tube (commonly known in the art as a hypotube), a polymer material, or polypropylene. An exemplary dimension for the shaft is a 4F ($\approx 0.053"$) but for coronary applications a size of 8F or smaller will be suitable. An exemplary length for the catheter shaft 21 is 51" but for coronary applications lengths from 15" to 60" are suitable.

Referring to Figure 4, the catheter shaft 21 includes a first lumen 24 and a second lumen 26. The first lumen 24 is used to house and guide the vessel puncturing element of the drug delivery catheter 20. The second lumen 26 is used to house a guidewire or fixed wire 28 in order to advance the catheter to the desired location in a manner known in the art. In an exemplary embodiment, the first lumen 24 is "D" shaped and has a height h_{L1} of about 0.022" and a width W_{L1} of about 0.042"

and the second lumen 26 has a height h_{L2} of about 0.016" and a width W_{L2} of about 0.023".

In the illustrated embodiment, the vessel puncturing device comprises a needle 22 which is bent at its distal end to define a short U-shaped portion. The bent tip 22a of the needle 22 defines the puncturing element. The needle defines a tube through which the drug agent may be delivered. Thus, with this preferred embodiment, the needle 22 functions as both the puncturing element as well as the drug delivery means. Preferably, the needle 22 is joined to a thicker tube 25 which may be bonded to another slightly larger tube. In an exemplary embodiment the needle 22 is a sharpened hypotube with an OD of 0.008" and an ID of 0.004". The needle 22 is bonded using cyanoacrylate to a polyamide tube 25 with an OD of 0.018" and an ID of 0.016" and a length of about 10". The tube 25 is in turn bonded using cyanoacrylate to a hypotube having an OD of 0.014" and an ID of 0.007" and a length of about 3.5'.

The needle 22 is comprised of a material which will provide a certain degree of opening force when the tip 22a is bent towards a position parallel with the catheter shaft 21. The amount of opening force will also depend on the angle ϕ of the bend and the length L of the tip 22a. In an exemplary embodiment, the needle 22 is a stainless steel hypotube with an angle ϕ in the completely opened or relaxed position being about 30° and the length L of the tip 22a being about 6mm. Suitable materials for the needle or hypotube include spring steel, stainless steel, titanium, nitenol, a polymer or copolymer or some combination of these materials. The ID of the needle 22 may vary from less than 0.001" to about 0.131" and have OD from smaller than 35 gauge to about 6 gauge. Exemplary OD's for the needle 22 for coronary applications are from 30 to 36 gauge.

As illustrated in Figure 6, the point of the tip 22a is preferably beveled at an angle θ for varied cutting effects. In an exemplary embodiment, the angle θ is about 25°. Patterns may also be formed on the sharpened end of the needle tip 22a to optimize its cutting or puncturing properties.

It will also be recognized that the lumen of the needle 22 may have various shapes. In an exemplary embodiment, the shape of the needle lumen is round, but the needle lumen may also be oval, rhomboid, trapezoidal, triangular, or rectangular.

Although only a single needle is illustrated in this embodiment, the drug delivery catheter 20 may comprise a multitude of needles.

Manifold 32 comprises an external body which has a port communicating with the guidewire lumen 26 for the introduction of the guidewire 28 through the catheter 20. The manifold 32 also includes an actuator which communicates with the needle 22 in such a way that a fluid can be delivered through the lumen in the needle 22. The actuator may comprise for example a syringe 33 which may be used to infuse the fluid into the needle 22. A suitable syringe is a standard luer lock 5cc syringe available from Becton Dickinson. The infusion may also be accomplished by other methods such as an infusion pump or gravity.

Referring to Figure 16, an manifold 32 includes the actuating element. The manifold 32 includes a manifold body 50 with grooves 51. A mating member 58 includes ribs 52 which slide into the grooves 51. The needle 22 (not shown in Figure 16) is bonded to the end 54 of the member 58. A lock 56 formed of members 56a and 56b bonded together locks the body 50 to the engaging member 58 as the lock 56 is rotated. Thus, the needle 22 will move as the member 58 is moved and then is locked in the desired position.

As illustrated best in Figures 3 and 6, the catheter shaft 22 includes a window 30 near its distal end. When the distal tip 22a of the needle 22 is positioned such that it is distal of the distal portion of the window 30 (Figure 2), the needle tip 22a is bent and housed completely within the catheter shaft 21 thus defining a retracted position for the puncturing element. As the needle 22 is pulled in a direction toward the proximal end of the catheter 20, the tip 22a of the needle 22 will begin to protrude radially outwardly and outside the perimeter of the catheter shaft 21 through the window 30. As the tip of the needle tip 22a protrudes outwardly, it will move until it engages the inner surface of the vessel wall 23. Upon further movement of the proximal end of the needle 22 in the proximal direction, the needle tip 22a will puncture the vessel wall 23 as illustrated in Figure 3.

As illustrated in Figures 2, 3 and 6, ²of the present invention may also include a trolley which is used to guide the needle 22 back into the window 30 when the needle 22 is advanced forward to move the needle 22 to its retracted position. In the illustrated embodiment, the trolley includes a wire loop 34 which surrounds the needle 22 and a plug 36 to which the wire loop 34 is attached. The plug 36 may be, for example, tubing filled with an adhesive. The wire loop 34 may be attached to the plug 36 by bonding or any other suitable method. The plug 36 and loop 34 can move freely in the axial direction in the inner lumen 24 of the catheter shaft 21. The plug 36 may also serve as a cam to inhibit rotation of the needle 22.

The location of the window 30 will be determined by the specific use contemplated for the device. In an exemplary embodiment used for coronary applications, the window 30 will be 3mm long and disposed about 20mm from the distal tip of the catheter 20. It

will be recognized, of course, that the window size and location may vary for other applications such as peripheral applications.

As illustrated in Figures 7 and 8, the catheter 20 of the present invention may also include a plurality of cams 38 which act as anti-rotation means for the needle 22. The cams 38 may be bonded, to the hypotube and spaced at suitable distances, for example (distance) apart. A suitable bond for the cams is cyanoacrylate. In the illustrated embodiment, the cams 38 are D-shaped and have a width of approximately 0.418", a height of approximately 0.223", a length of approximately 0.844" and an inner aperture for the hypotube needle 22 having a diameter of approximately 0.019". These cams 38 may be made of a material such as platinum or PTFE or a combination of a polymer and metals. With such materials, the cams 38 may aid in the visualization of the movement of the needle tip 22a on a fluoroscope.

It will be recognized by those skilled in the art that other suitable anti-rotation means may be employed. For example, the needle 22 and lumen 24 may be provided with mating gears. Figure 15 illustrates an embodiment where a gear 60 is bonded to the needle 22 and a mating gear 62 is formed in the tube 61.

It will also be possible to coat the inner diameter and outer diameter of the various tubes with materials such as teflon, silicone, or HPC to reduce friction between the sliding elements.

Referring now to Figure 11, the catheter of the present device may also include an opening gauge which is comprised of a plurality of markers 64 disposed on the hypotube 22 and a marker 66 on the catheter shaft 21. These markers may be made of a material such as platinum and bonded to the respective tubes. In this manner, the markers may be used to gauge the degree to which the tip 22a of the needle has opened and penetrated the vessel.

It will be recognized that the plurality of markers may be disposed on the catheter shaft 21 and a single marker on the needle 22.

Figures 9 and 10 illustrate another preferred embodiment of the invention which includes an inflatable balloon 38. The balloon 38 is used to enable controlled placement/penetration of the needle 22. The balloon 38 is placed distally of the window 30 in the illustrated embodiment. It will be recognized, of course, that the balloon 38 may also be placed proximal of the window 30. This balloon 38 will stabilize or hold the shaft 21 at the desired position in the vessel as the needle 22 is retracted and opened to its puncturing position. The balloon 38 may also serve as a means for inducing hemostasis in the site of the puncture or it may be used for dilatation before, during, or after the delivery of the drug. It will be recognized that the balloon 38 may also be used to perform PTCA or similar procedures.

For the embodiment illustrated in Figures 9 and 10, which comprises the balloon 38, a third lumen is provided for inflating the balloon 38. Figure 10 shows a cross-section of the catheter shaft which includes lumens 40, 42, and 44. These lumens 40, 42 and 44 may be used for a guide wire lumen, a lumen for the needle 22, and an inflation lumen for the balloon 38, respectively.

It is also possible that the device may be coated with a material which will make the needle 20 detectable or enhance its detectability by intravascular ultrasound. The location of the components of the delivery apparatus can then be determined with respect to one another via the use of a separate intravascular ultrasound probe, or a probe which is a component of the device itself. This will allow the physician to monitor the position of the needle as it enters its target site. It will also be recognized that the device may be coated with a material which will enable or enhance its

visualization by methods such as MRI, CT scanning, X-Ray, Gamma camera imaging, or PET scanning.

The drug delivery catheter 20 of the present invention is used to deliver drugs to the desired treatment site as follows. The catheter 20 is guided to the site which is to be treated under fluoroscopy using standard PTCA guiding catheter and guidewire techniques. The catheter 20 is advanced such that the window 30 is placed at the particular site where the drug is to be delivered. The hypotube 22 is then pulled back such that the needle tip 22a exits radially outward from the window 30 and is inserted into the vessel wall 23. The needle tip 22a is then moved further radially outward until the tip 22a is at the desired location. The needle may be positioned to deliver the drug: between the inner and out surfaces of the vessel wall 23; to the adventitial side or outer surface of the vessel wall 23; or between the tissue 27 surrounding the vessel wall 23 and the outer surface of the vessel wall 23. The drug agent is then infused into the desired location using the syringe 33 attached to the manifold 32. Since the catheter does not block the flow of blood, the infusion may take place over almost any desired period of time. After the infusion is complete, the hypotube 22 is pushed forward to remove the needle tip 22a from the vessel wall 23 and to place the needle tip 22a into place within the distal tip of the catheter 20 parallel to the catheter shaft 21.

The illustrated embodiments uses a needle which is in a retrograde position. Since the needle is angled in this retrograde path, it is protected from being filled with flowing blood and causing dissection, and allowing the track to clot. It will, however, be recognized by those skilled in the art that other positions are possible. For example, the needle may protrude directly radially outward or may even project in

a forward direction toward the distal end of the catheter 20.

Figures 12 and 13 show another embodiment of the drug delivery catheter of the present invention. In this embodiment, the needle 72 is moved to the puncturing position to puncture the wall of the vessel 78 (shown in Figure 13) by means of an inflatable balloon 76. Inflation fluid is provided through an inflation port 74. When the window 70 has been positioned at the desired location, the balloon is inflated until the needle has puncture the wall.

Figure 14 shows another embodiment where the needle 72 is moved by means of fluid pressure being applied to a flexible flap 82 through a port 80. The drug being administered itself may take various forms. For example, the drug may be delivered in the form of a polymeric rod or spike loaded with a drug which will be implanted next to the area which is to be treated. In this form, the rod or spike would be preloaded into the tip 22a of the needle 20 and would be ejected from the needle 20 as fluid pressure is applied by means of the syringe 38 to the other end of the needle 20. The catheter 20 may also be used to inject microcapsules loaded with the drug which will be placed in close proximity to the area to be treated. The catheter may also be used to deliver an emulsion of liposomes loaded with the drug which will be placed in close proximity of the area to be treated.

In these embodiments where the drug is encapsulated or loaded in a biodegradable material, the implants will remain and release the drug agent over a selected period of time after the catheter has been removed from the vessel. The device, however, can also be used to deliver the drugs in fluid for in high concentration between the outer wall of the vessel being treated and fatty tissue which surrounds the vessel. A

list of potential drugs which may be used with the present invention is provided below in Table 1.

TABLE 1

A Thrombolytic	A fragment of a glycoprotein
An Anti-thrombotic	A recombinant glycoprotein
An Anti-proliferative	A fragment of a recombinant glycoprotein
An Anti-platelet	A Carbohydrate or a fragment thereof
A Protein	An Antiarrhythmic
A Peptide	A beta blocker
A fragment of a recombinant peptide/protein	A calcium channel blocker
A fragment of a non-recombinant peptide/protein	A vasodilator
Genetic material	A vasoconstrictor
A recombinant peptide/protein	An inorganic ion or mixture thereof
A glycoprotein	

Other steps may be used to further enhance the treatment provided by the present invention. For example, the needle can be heated or cooled to enhance the performance of the device. The catheter can be used to deliver and activate hot or cold activated drugs.

The needle can also be made to vibrate at various frequencies to enhance the performance of the device (i.e. to optimize drug delivery). For example, the catheter can be used to deliver and activate sonically activated drugs.

It is also conceivable that the device may have a conduction path for the conduction, transfer or passage of light such that the device will deliver a predetermined wave length of light to a specific portion of the vessel or body cavity, the vessel wall, or to a specific portion of the adventitia. The light may then

be used to deliver and activate light-activated drugs. The catheter can be used to deliver a substance which will carry the energy of light through wave lengths and/or energy transitions or which will deliver a substance which will carry energy through wave lengths and/or energy transitions.

The device can also have selectively or non-selectively magnetized elements or can be used to induce an electric charge or induce a magnetic field in a selected area. The device can then be used to deliver and activate electrically-activated drugs.

Other uses for the catheter of the present invention are the delivery of a matrix to the exterior of a body lumen or cavity to structurally reinforce the area. A drug may be impregnated in this matrix and delivered coincidentally. The device may also be used to deliver a material that can be hardened in the wall or on the adventitial side. The hardened material may be used to form an extravascular stent or an intravascular stent depending on the precise delivery location.

The device may also be used to remove substances by using a vacuum in the needle lumen (microsuction).

Therefore, the device of the present invention provides a new and novel apparatus and technique which can be used to deliver drugs or other materials in close proximity to the extravascular side of a vessel. In addition to providing treatment for coronary disease, the present invention may be used to treat other disorders involving lumens or lumen-like vessels in the body such as prostatitis, the delivery of cancer chemotherapeutics, and the site specific delivery of controlled release antibiotics for the treatment of pericarditis, myocarditis, or endocarditis.

The present invention may also be used for delivering agents to the myocardium which have

cardioprotective effects on myocardium exposed to a global or sub-global ischemic insult i.e. induced cardiologia during an "open heart" operation in which it is necessary to stop the heart and put the patient on cardiopulmonary bypass. Possible agents to be delivered include heat-shock proteins, hormones, ATP and its biochemical precursors, glucose or other metabolic carbohydrates. The treatment can allow the heart to recover function quicker after reperfusion by reducing the "myocardial stunning" that occurs due to global ischemia.

The foregoing description of the preferred embodiments of the present invention has been presented for purposes of illustration and description. The disclosed embodiments are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teachings. It is intended that the scope of the invention be defined by the following claims, including all equivalent.

WE CLAIM:

1. A method of treating a vessel having a vessel wall with an inner surface, the method comprising the steps of:
 - inserting a catheter having a vessel puncturing element disposed therein into the vessel;
 - positioning the puncturing element at the site in the vessel to be treated;
 - puncturing the vessel wall at the site to be treated with the puncturing element; and
 - delivering a drug outside of the inner surface of the vessel wall through the puncture in the vessel wall.
2. The method of claim 1 wherein the step of delivering the drug comprises delivering the drug into the vessel wall.
3. The method of claim 1 wherein the step of delivering the drug comprises delivering the drug to the outer surface of the vessel wall.
4. The method of claim 1 wherein the step of delivering the drug comprises delivery of the drug into tissue surrounding the vessel wall.
5. The method of claim 1 wherein the step of delivering the drug comprises the step of delivering a drug in a time release module.
6. The method of claim 1 wherein the puncturing element includes a drug delivery lumen and wherein the step of delivering the drug comprises delivering the drug through the drug delivery lumen.

7. An drug delivery catheter comprising:
an elongated catheter shaft adapted to be
inserted into a vessel having ^{a vessel} wall, the catheter shaft
having an inner lumen and a window;
a puncturing element housed in the inner lumen
near the distal end of the shaft, the puncturing element
having a retracted position and a puncturing position;
means for moving the puncturing element from
the retracted position to the puncturing position,
whereby the puncturing element extends such that it does
not engage the vessel wall when in the retracted position
and extends outwardly of the catheter shaft to engage and
puncture the vessel wall when in the puncturing position;
a tube for delivering a drug to the puncture in
the vessel wall.

ABSTRACT OF THE DISCLOSURE

A drug delivery catheter is provided which includes a catheter comprised of an elongated tubular shaft with an inner lumen and a vessel puncturing element which is housed in the lumen. The puncturing element has a retracted position such that it will not be in contact with the vessel wall as the catheter is guided through the vasculature. The puncturing element also has a puncturing position where it protrudes radially outward of the catheter shaft and engages and punctures the vessel wall. The catheter is first inserted into the vessel to be treated and the puncturing element is positioned at the site in the vessel to be treated. The puncturing element is then moved to its puncturing position and the inner surface of the vessel wall is punctured. A drug is then delivered through the puncture. The drug may be delivered into either the vessel wall itself or to the outside of the vessel wall.

APR 22 2002

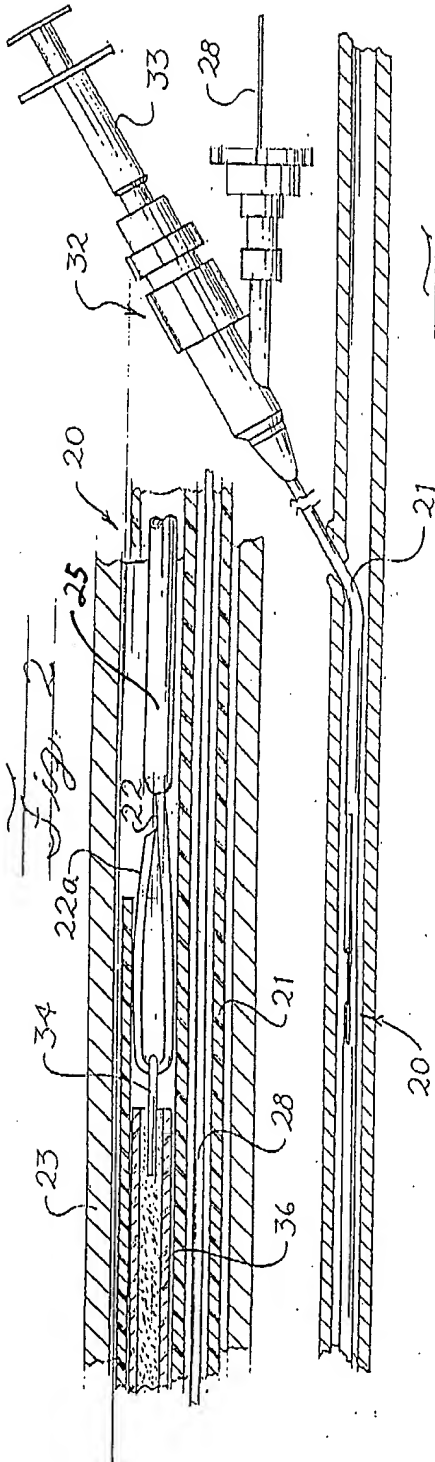


Fig. 1

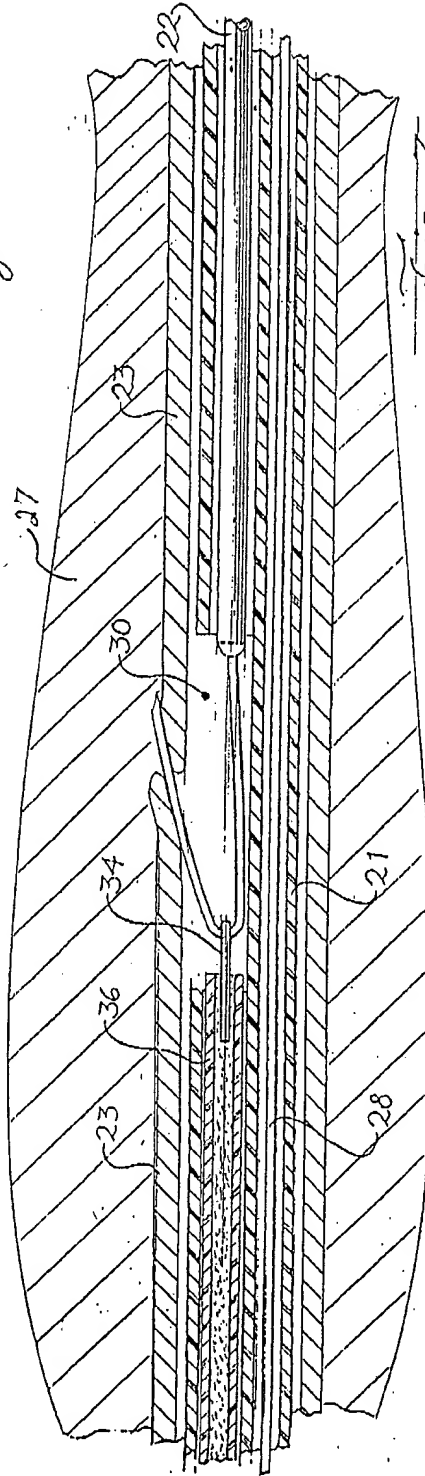


Fig. 2

Fig. 4

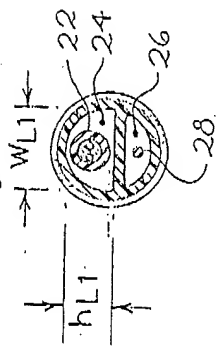


Fig. 5

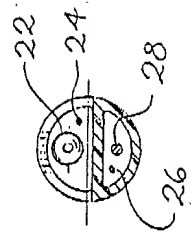
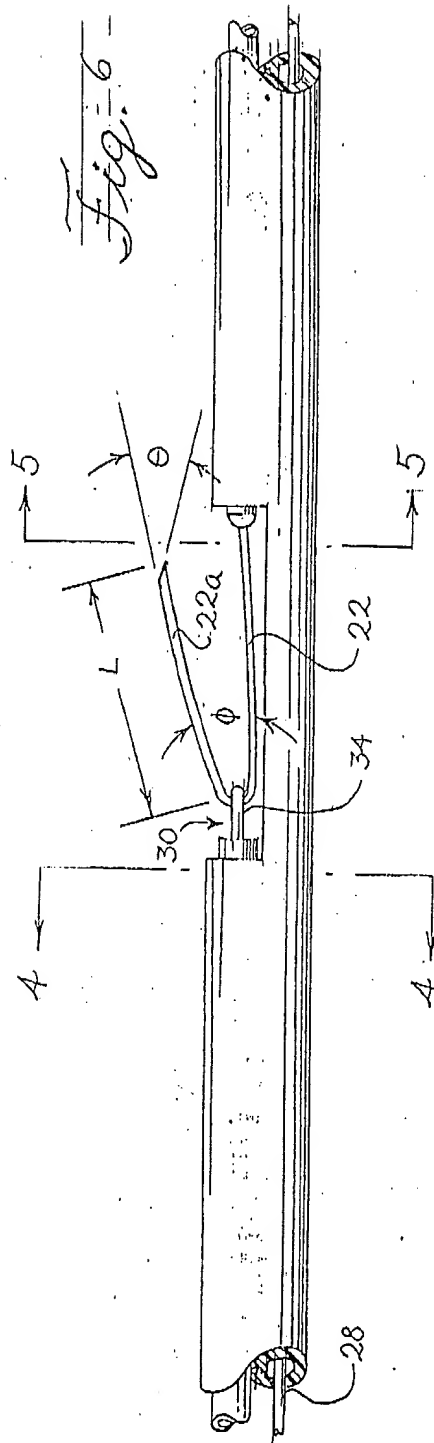


Fig. 6



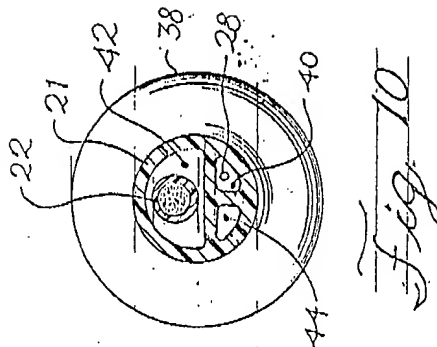
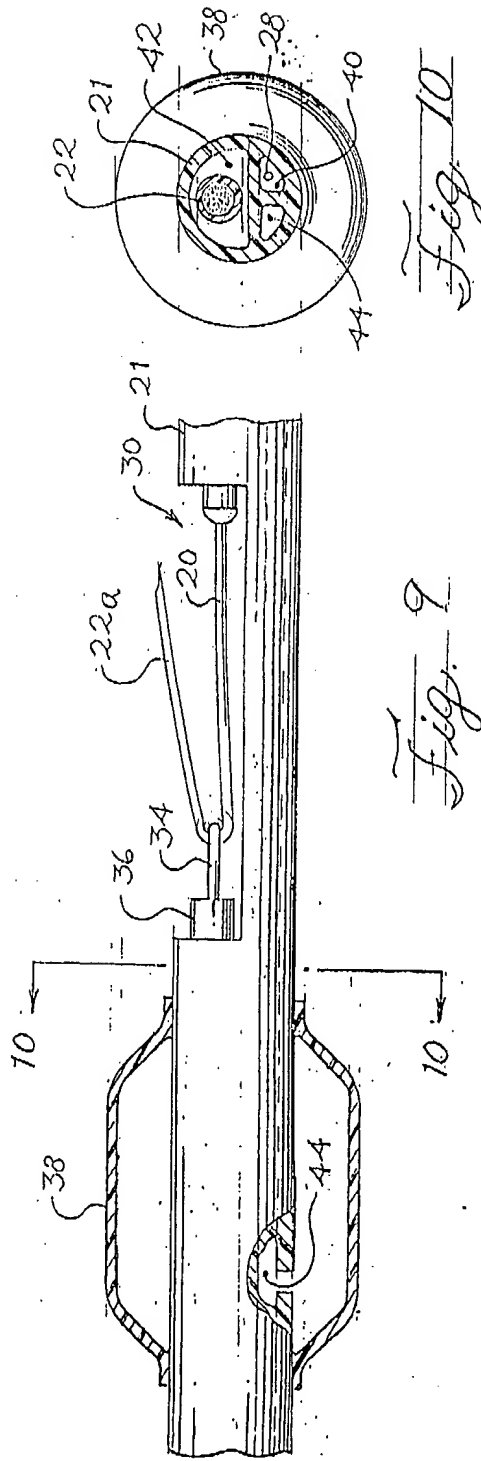
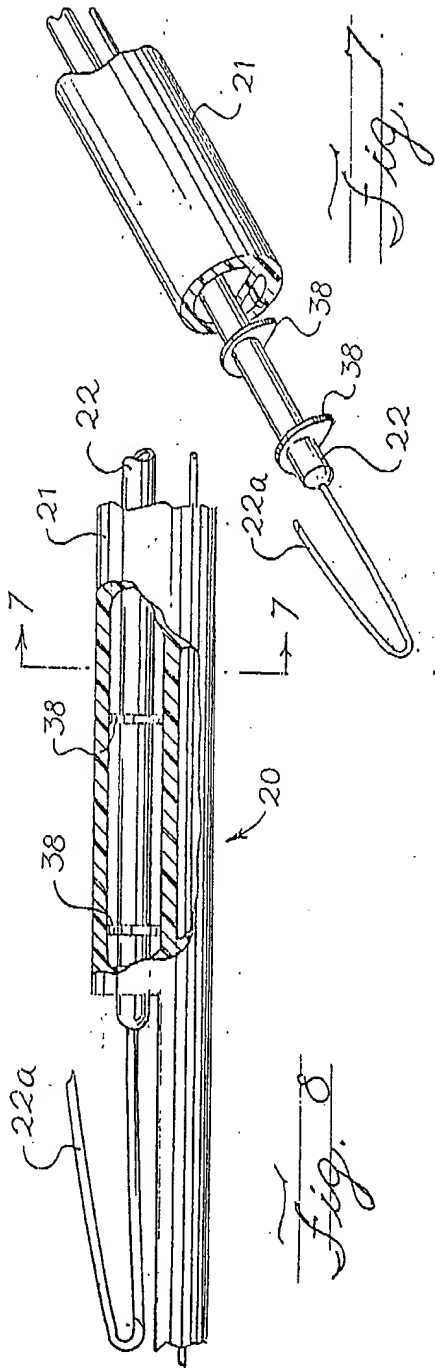


Fig. 14

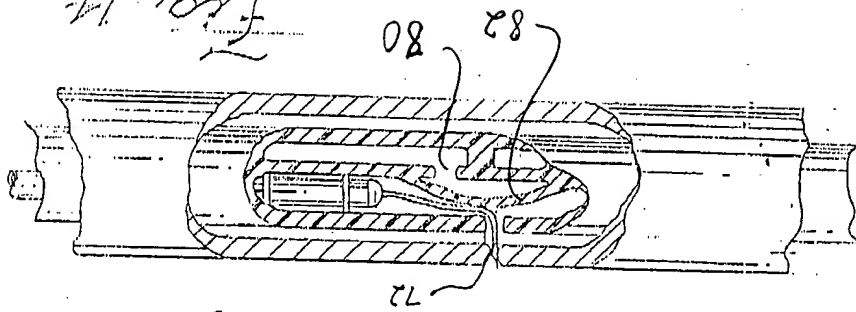
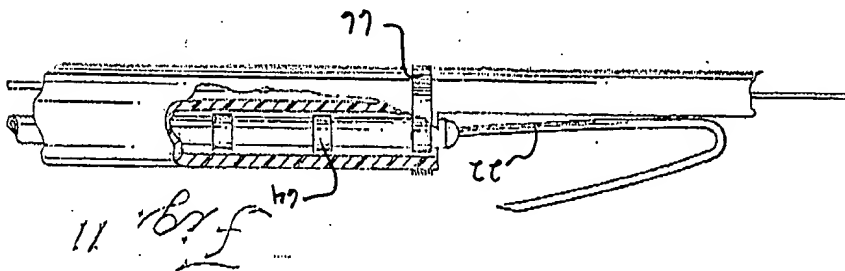
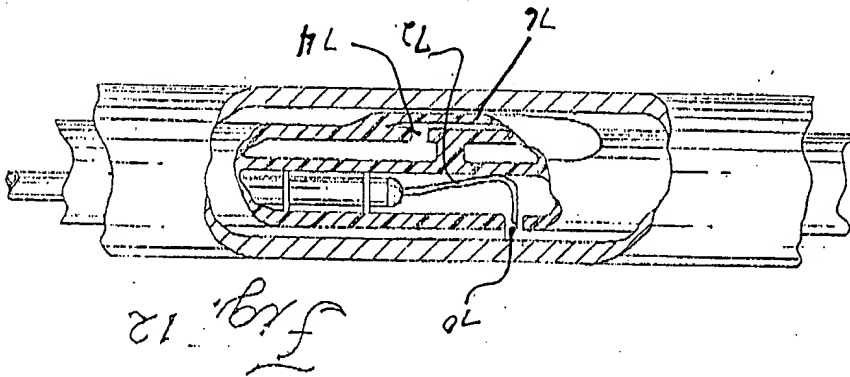
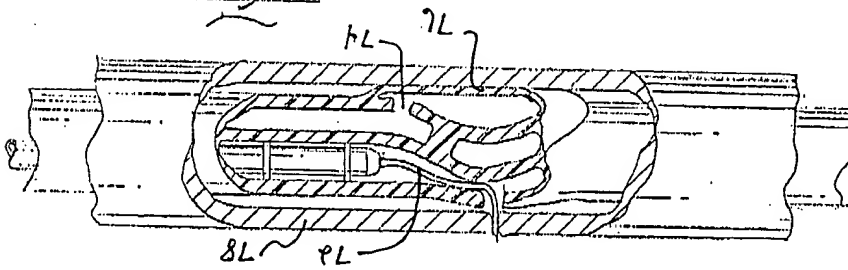


Fig. 13



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PATENT APPLICATION TRANSMITTAL LETTER

To the Commissioner of Patents and Trademarks:

Transmitted herewith for filing is the patent application of: Bradley C. Linden and Donald F. Palme II for INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD

Enclosed are:

- ☒ 5 sheet(s) of drawings.
- ☐ Declaration.
- ☐ Power of Attorney.
- ☐ Verified statement to establish small entity status under 37 CFR §§ 1.9 and 1.27.
- ☐ Assignment transmittal letter (in duplicate) and Assignment of the invention to _____.
- ☐ _____

Claims as Filed	Col. 1	Col. 2
For	No. Filed	No. Extra
Basic Fee		
Total Claims	7 - 20	* 0
Indep. Claims	2 - 3	* 0
Multiple Dependent Claim Present		

*If the difference in col. 1 is less than zero, enter "0" in col. 2.

Small Entity	
Rate	Fee
	\$315
0 x \$10 = \$	
0 x \$30 = \$	
+ \$100 = \$	
Total	\$

Other Than Small Entity	
Rate	Fee
	\$630
0 x \$20 = \$ -0-	
0 x \$60 = \$ -0-	
0 + \$200 = \$ -0-	
Total	\$630

- ☐ Please charge my Deposit Account No. 23-1925 in the amount of \$ _____. A duplicate copy of this sheet is enclosed.
- ☒ A check in the amount of \$630.00 to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.
- ☒ Any additional filing fees required under 37 CFR § 1.16.
- ☒ Any patent application processing fees under 37 CFR § 1.17.
- ☐ The Commissioner is hereby authorized to charge payment of the following fees during the pendency of this application or credit any overpayment to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.
- ☐ Any filing fees under 37 CFR § 1.16 for presentation of extra claims.
- ☐ Any patent application processing fees under 37 CFR § 1.17.
- ☐ The issue fee set in 37 CFR § 1.18 at or before mailing of the Notice of Allowance, pursuant to 37 CFR § 1.311(b).

Date

7/14/92

Gustavo Siller, Jr.
Registration No. 32,305

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Initials of Receiving Clerk	Weight lbs. oz.	Country Code	G.O.D.				\$
ACCEPTANCE		International	Return Receipt				
<input type="checkbox"/> Next Day Delivery	<input type="checkbox"/> Second Day Delivery	Total Postage & Fees \$					
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Express Mail Corporate Account No.	Federal Agency Account No.	Total Postage & Fees \$					
FROM: GUSTAVO SILLER JR WILLIAM BRINKS JR MBC TOWER SUITE 3600 455 N CITYFRONT PLAZA DR CHICAGO IL 60611-5599							

MAILING LABEL
Service Analysis & Proof of Delivery

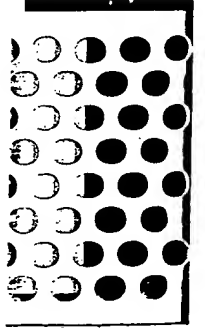
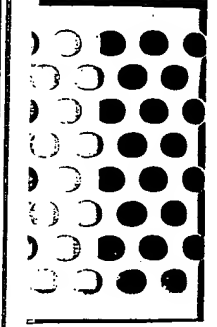
DESTINATION	Date of Delivery	M	D	Y	Time of Delivery	A.M. P.M.
<input checked="" type="checkbox"/> Signature of Addressee or Agent						
DELIVERY WAS ATTEMPTED	Date:	M	D	Y	Time:	A.M. P.M.
Signature of Delivery Employee	1.	2.				
Waiver of Signature and Indemnity (Domestic Only)	I wish delivery to be made without obtaining the signature of the addressee or the addressee's agent (if in the judgment of the delivery employee, the article can be left in a secure location) and I authorize the delivery employee to sign that the shipment was delivered and understand that the signature of the delivery employee will constitute valid proof of delivery.					
SIGNED:						
TO:	HONORABLE COMMISSIONER OF PATENTSTAND TRADEMARKS WASHINGTON DC 20231-0001					
Telephone Number:						



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REMITTANCE ADVISE PHONE			TOTALS →		
			\$630.00		

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WILLIAN BRINKS OLDS HOFER GILSON & LIONE <i>Willian Brinks Olds Hofer</i>		
11 14 2847 11 10710001521010701211		



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NOTICE OF MAILING TO PATENT OFFICE

ENTERED ON WORKING CARD

APPLICANT: Bradley C. Linden & Donald F. Palmer II
CLIENT/MATTER NO.: 3570/216
(CASE NO.):

ITEM(S) MAILED:

Patent Application Transmittal Letter (in duplicate), Specification (24 pages including Abstract), Drawings (5 sheets), check for filing fee, and postcard.

DATE DUE:

DATE OF MAILING:

7/14/92

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EXPRESS MAIL LABEL NUMBER

MEMO TO:
SEC'Y
INT'L

CS pdn
ATTORNEY/SECRETARY

Case No. 3570/216
Applicant Bradley C. Linden
Donald F. Palmer II

Hon. Commissioner of Patents & Trademarks
Washington, D.C. 20231

Please acknowledge receipt of the below-identified:

Patent Application Transmittal Letter (in duplicate), Specification (24 pages including Abstract), Drawings (5 sheets), check for filing fee, and postcard.

WILLIAM BRINKS OLDS HOFER GILSON & LIONE
A PROFESSIONAL CORPORATION

By Gustavo Siller, Jr.

WILLIAM BRINKS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE

SUITE 3600

CHICAGO, ILLINOIS 60611-5599

TELEPHONE 312 321-4200

CABLE JUDICATURE CHICAGO

TELEX 254300

FACSIMILE 312 321-4299

April 10, 1994

KARL A. VICK

(312) 321-4247

WASHINGTON OFFICE
2000 K STREET, N.W.
SUITE 200
WASHINGTON, D.C. 20006-1809
TELEPHONE 202 429-0625
TELEX 650 383-5605
FACSIMILE 202 293-1850
ARLINGTON, VA. OFFICE
CRYSTAL PLAZA ONE
SUITE 208
2001 JEFFERSON DAVIS HWY.
ARLINGTON, VIRGINIA 22202-3603
TELEPHONE 703 415-0303
TELEX 140994
FACSIMILE 703 415-0304

Mr. Richard Nolan
939 Ridgeway Avenue
Munster, Indiana 46321

Re: 3570/216

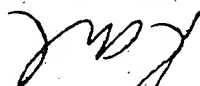
Dear Rick:

Enclosed are informal drawings for the above-identified application, along with a copy of the application and a copy of the PTO Draftsman's comments.

Please prepare formal drawings corresponding to the enclosed informals. I need to have the formals before July 1, 1994.

Please call me if you have any questions.

Sincerely,



Karl A. Vick

KAV/lav
Enclosure

WILLIAN BRINKS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE
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FACSIMILE 317 634-6701

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TOLEDO, OHIO 43604-1537
TELEPHONE 419 244-6578
TELEX 140342
FACSIMILE 419 244-8862

KARL A. VICK
(312) 321-4247

April 10, 1994

Peter J. Gafner, Esq.
SciMed Life Systems, Inc.
One SciMed Place
Maple Grove, Minnesota 55311-1566

Re: U.S. Application Serial No. 07/913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our file No. 3570/216

Dear Peter:

The above-identified application was formally allowed
as of April 1, 1994.

Enclosed is a copy of the Examiner's Amendment. I
agreed to this Amendment during a phone conference with Examiner
Maglione. The changes mainly clarify the claim language. Please
review the amendment and let me know if you have any comments.

An issue fee of \$1,170 for the 29 allowed claims is due
to be paid within three months after the date of allowance.
Unless we hear from you to the contrary, we will arrange to pay
this fee toward the end of the three-month period.

We will write to you again when the Patent and
Trademark office notifies us of the patent number and issue date
assigned to the application.

Sincerely,



Karl A. Vick

KAV/law
Enclosure

WILLIAM BRINKS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE
SUITE 3600

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TELEPHONE 703 415-0303
TELEX 140994
FACSIMILE 703 415-0304

February 25, 1994

KARL A. VICK

(312) 321-4247

Via Telecopy
1-612-494-2550

Peter J. Gafner, Esq.
SciMed Life Systems, Inc.
One SciMed Place
Maple Grove, Minnesota 55311-1566

Re: U.S. Application Serial No. 07/913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our file No. 3570/216

Dear Peter:

Enclosed is a draft copy of a response to the October 26, 1993 office action in the above-identified application. At the end of the draft, I have included the status of the claims after entry of the requested amendments.

I have previously spoken with Dave VandenEinde about the approach we should take in responding to the rejections. In general, I believe that the distinguishing structural features of the invention are its curved needle construction and direction of movement, and I have tried to reflect these distinctions in the claims.

Please let me have your comments.

Peter J. Gafner, Esq.
February 25, 1994
Page 2

Please note that the 4-month response date is Monday,
February 28, 1994.

Sincerely,

A handwritten signature in cursive script, appearing to read "Karl", with a long, sweeping horizontal stroke extending to the right.

Karl A. Vick

KAV/law

WILLIAM BRINKS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE
SUITE 3600

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February 25, 1994

KARL A. VICK
(312) 321-4247

Via Telecopy
1-612-494-2550

Peter J. Gafner, Esq.
SciMed Life Systems, Inc.
One SciMed Place
Maple Grove, Minnesota 55311-1566

Re: U.S. Application Serial No. 07/913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our file No. 3570/216

Dear Peter:

Enclosed is a draft copy of a response to the October 26, 1993 office action in the above-identified application. At the end of the draft, I have included the status of the claims after entry of the requested amendments.

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Please let me have your comments.

Peter J. Gafner, Esq.
February 25, 1994
Page 2

Please note that the 4-month response date is Monday,
February 28, 1994.

Sincerely,

A handwritten signature in cursive script, appearing to read "Karl", written in dark ink.

Karl A. Vick

KAV/law

WILLIAM BRINKS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE

SUITE 3600

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TELEPHONE 703 415-0303

TELEX 140994

FACSIMILE 703 415-0304

KARL A. VICK

(312) 321-4247

November 19, 1993

Mr. Donald F. Palme II
SciMed Life Systems, Inc.
6655 2Wedgwood Road
Maple Grove, Minnesota 55311-3648

Re: U.S. Application Serial No. 913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our File No. 3570/216

Dear Don:

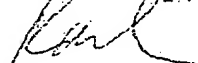
We have recently received an Office Action in connection with the above-identified application. A copy of the Office Action is enclosed, along with a copy of the newly cited reference.

Please review the cited references and the Examiner's art-based rejections, and then call me to discuss your comments.

A response is due by January 26, 1994, and three one-month extensions are available upon payment of the required extension fees. Therefore, the absolute latest date to respond is April 26, 1994.

I look forward to hearing from you.

Sincerely,



Karl A. Vick

KAV/law

Enclosure

cc. Mr. Dave VandenEinde (with enclosure)
Ms. Patrice Stromberg (w/o enclosure)
Ms. Jeannine Bowen (w/o enclosure)

SCIMED®

July 20, 1993

Karl Vick, Esq.
Willian, Brinks, Olds, Hofer, Gilson & Lione
NBC Tower
455 North Cityfront Plaza Drive
Suite 3600
Chicago, IL 60611-5599

re: 3570/216 Intra-Extra Vascular Drug Delivery Catheter and Method

Dear Karl:

This letter is to inform you that SCIMED will not be pursuing foreign protection in the above referenced file, at this time.

If you have any questions, please feel free to give me a call.

Sincerely,

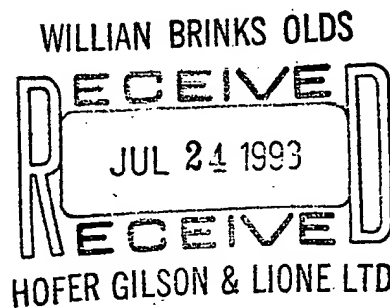
SCIMED LIFE SYSTEMS, INC.



David A. VandenEinde
Patent Engineer

DVE/md

cc: Corresponding SCIMED file



WILLIAN BRINKS OLDS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE

SUITE 3600

CHICAGO, ILLINOIS 60611-5599

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TELEPHONE 419 244-6578
TELEX 140342
FACSIMILE 419 244-8862

KARL A. VICK

(312) 321-4247

July 13, 1993

Mr. David A. VandenEinde
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, Minnesota 55311-3648

Re: U.S. Application Serial No. 07/913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our File No. 3570/216

Dear Dave:

Enclosed is a copy of a sketch I received from Don
Palme. The sketch discloses an additional embodiment of the
"Intra-extravascular Drug Delivery Catheter and Method" invention
referenced above.

Please let me know whether you would like us to file a
continuation-in-part application covering this embodiment.

Sincerely,


Karl A. Vick

KAV/law
Enclosure

To
MANIFOLD

Needle
Lumen

Needle

Needle could be deployed
in the duct

PICH Balloon

Guide wire

Balloon Inflation
Lumen

Needle

CROSS SECTION
Needle guide

inner lumen

INFLATION Lumen

Balloon

11 Wall of Balloon

3/10/93

WILLIAM BRINKS OLDS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE

SUITE 3600

CHICAGO, ILLINOIS 60611-5599

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WASHINGTON OFFICE
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KARL A. VICK

(312) 321-4247

July 13, 1993

Mr. David A. VandenEinde
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, Minnesota 55311-3648

Re: U.S. Application Serial No. 07/913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our File No. 3570/216

Dear Dave:

Enclosed is a copy of a sketch I received from Don
Palme. The sketch discloses an additional embodiment of the
"Intra-extravascular Drug Delivery Catheter and Method" invention
referenced above.

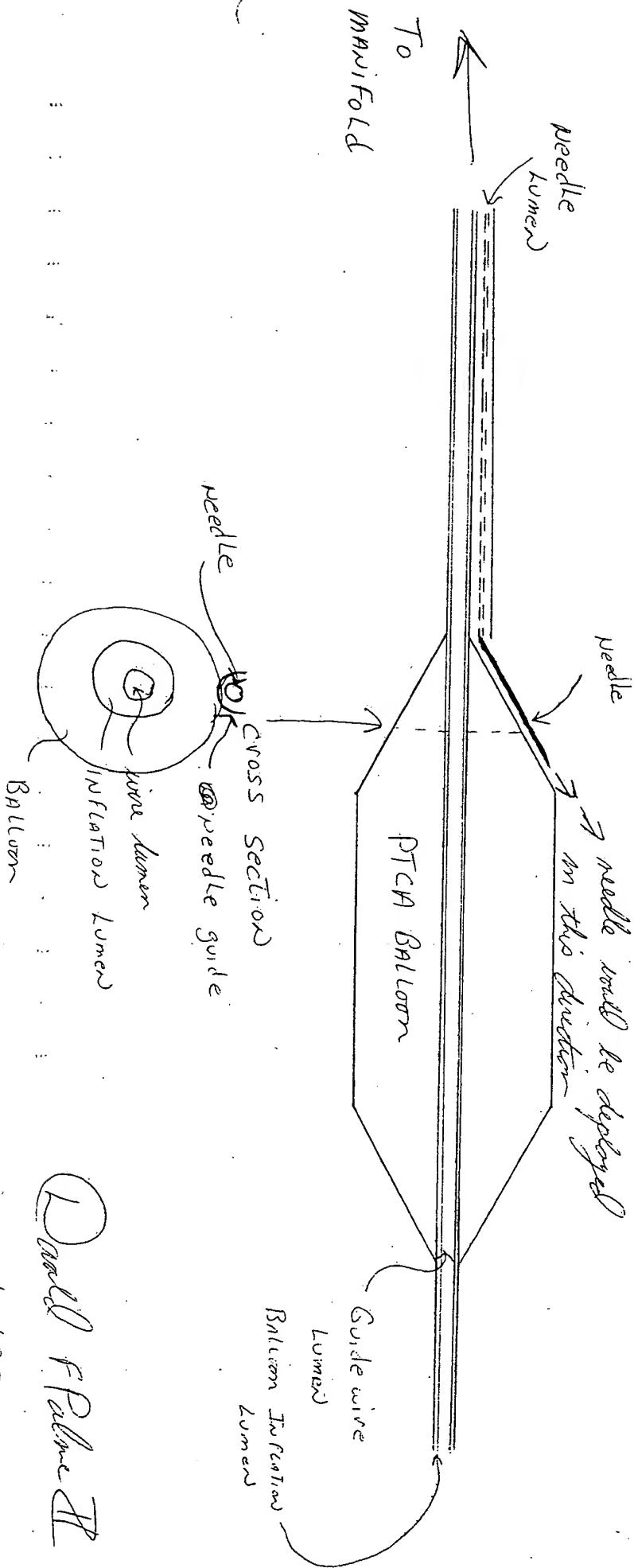
Please let me know whether you would like us to file a
continuation-in-part application covering this embodiment.

Sincerely,



Karl A. Vick

KAV/law
Enclosure



Donald F. Palmer II

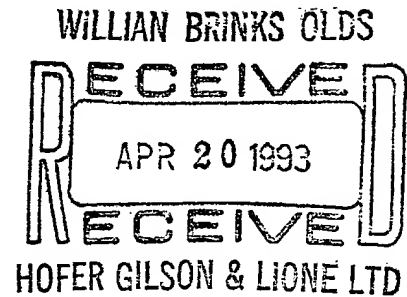
3/10/93



Cardiology Division

April 16, 1993

Willian Brinks Olds Hofer Gilson and Lione
NBC Tower
455 North CityFront Plaza Drive
Suite 3600
Chicago, IL 60611



RE: U.S. Patent Office Action on Application Serial No. 07/913,227

Dear Mr. Vick:

I will try to address each rejected claim with regards to the cited patents.

- 1) Rejection of claims 8-14 as anticipated by Sewell, Jr.
Frank Sewell Jr. U.S. patent number 5,152,772 describes a catheter for use as an adjunct to laparoscopic surgery. This device patent describes a catheter designed to cut muscle tissue in order to allow the common bile duct to expand and allow the passage of bile stones. This catheter is not designed for nor can it be adapted for use in other applications because of its size and design as known by persons skilled in the art of catheter design. The use of the balloons is for positioning in an organ duct. The use of a device of this design in a vascular region can not be anticipated by the inventor.

Our application number 913,227 is for a vascular catheter that is designed to deploy or deliver therapeutic agents site specifically through a vessel (or other ductal space) wall in order to improve performance of the therapeutic agent and decrease amounts normally required for systemic delivery. This device is not intended to cut or remove any material, tissue or expand any spaces. The catheter design is such as to minimize additional damage to such a space and to directly apply a therapeutic agent to the region. This catheter is designed for percutaneous deployment and would be non-functional in a laparoscopic surgical procedure as the device as described by Sewell which can not be deployed via a percutaneous method.

The use of a balloon as described in our patent application and as described by Sewell are for two different purposes. Sewell's use of the dual balloons is to enable the device to be retained in a duct space by expansion of the balloons

Mr. Karl Vick
William Brinks Olds Hofer Gilson and Lione
April 16, 1993
Page 2

both distally and proximally but outside of the space where the device is being used. Without these balloons the device would be non-functional. The balloon in our device is only for reproducible positioning of the device against a vessel wall for oversized vessels and for imaging purposes during the procedure.

The device as described by Hawkins et al. is clearly for the purpose of being implanted into a lesion in order to assist a surgeon in localizing a nonpalpable lesion during surgery. The needle as described in the patent is for deployment post localization in order to keep the device's tip in the lesion. This patent does not describe the delivery of any therapeutic agents via the needle or any other part of the device. The device as described in our patent application is for the delivery of therapeutic agent through a deployable piercing element (needle) into a tissue or through a vessel wall. Our device will not localize or be able to be retained in a particular location via the piercing element.

The patent as described by Bogue et al (patent number 4,270,535) describe the device as a double lumen catheter that is used for providing improved insertion into a blood vessel. This catheter is designed to allow access to blood via a intravenous method. The device as described uses the sharp tip to puncture the skin and vessel wall allowing placement of the device into the flow of blood. The trocar is then withdrawn and the device is connected to a blood pump or some other device for blood monitoring or exchange.

Our device is designed not to puncture the skin for placement into a blood vessel, but to use a vessel or vessel space in order to remotely gain access to a diseased site for the delivery of therapeutic agents. The piercing element is design to be a integral part of the catheter and is not removable as described by Bogue et al as a trocar. Our puncturing element is designed not to pierce through the vessel wall in order to gain access to the vessel for sampling or monitoring blood flow but is to be used in conjunction with PTCA (or other types of procedures) in order to delivery therapeutic agents site specifically from inside a space to outside the space into the surrounding tissue(s). This device is significantly different from the cited patents.

Mr. Karl Vick
Willian Brinks Olds Hofer Gilson and Lione
April 16, 1993
Page 3

In addition there are some additional changes to the submitted patent applications that have come to light. They are as follows:

Page 10: Line 27 0.422" is 0.0422"
 Line 28 0.227" is 0.0227"

Page 11: Line 10 0.014" is 0.018"
 0.015" is 0.016"
 Line 12: OD of 0.014"
 and an ID of 0.007" to 0.012"
 Line 22: 0.131" is 0.0131"

Page 13: Line 27: 0.418 is 0.0148"
 0.223" is 0.0223"
 Line 28: 0.844 is 0.0844"

Please review my feedback and let me know how we are going to proceed.

Sincerely,

A handwritten signature in cursive script that reads "Donald F. Palme II". The signature is written in dark ink and is positioned above the typed name and address.

Donald F. Palme II
SCIMED Life Systems
6655 Wedgwood Road
Maple Grove, MN 55311
(612) 494-1640

To: Karl Vick
William Brinks Olds Hofer Gilson and Lione
NBC Tower
455 North CityFront Plaza Drive
Suite 3600
Chicago, IL 60611

From: Donald F Palme II
SCIMED Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, MN 55311

Regarding: U.S. Patent Application Serial No. 07/913,227

Several changes need to be made to the application:

- 1) My name is Donald F. Palme II
- 2) Brad Lindens middle initial is C not G as in the application.

page 1: line 16; success in the treatment of atherosclerosis, it **can be**
(change to **is**).

Page 7 line 20; is flexible as to the drug, the number of drugs or drug combinations alone or incorporated into or part of time or control release mechanisms into which drug is incorporated can be delivered as well as the time frame over which they can be delivered.

Page 8 line 4: make a new paragraph at the start of "First, the catheter is inserted into the vessel or area to be treated.

page 10 line 24; is used to house a **fixed or removal** guidewire .

page 11 line 12; having a OD of 0.014" and an ID of 0.007" and a length of 3.5".

Additional claims or changes:

21) Said catheter as defined in claim 9 is designed such that the puncturing element is deployed at an angle in a forward manner.

22) Said catheter as defined in claim 9 is designed such that the proximal manifold is designed to deploy puncturing element in a controlled reproducible manner by a sliding shaft mechanism, and a second manifold fitting is designed for a guidewire lumen access,

and a third manifold fitting is designed for a inflation lumen.

23) Said catheter as defined in claims 9 is designed such that the forward displacement angle of the puncturing element is controlled by the angle of the proximal balloon cone whereas the balloon is that typically used for angioplasty.

24) A method of claims 1 and 9 whereas the drug delivered is for an anti-proliferative drug for the treatment or prevention of restenosis or other vascular diseases.

25) A method of claim 24 where the drug is a specific inhibitor of cellular proliferation including heparin, heparin derivatives, anti-neoplastic agents, steroidal compounds, leukotrienes, prostaglandins, ace inhibitors and other such agents.

26) A method of claim 24 where the drug is a specific inhibitor or inactivator of thrombin including such drugs as heparin, hirudin or others.

27) A method of claim 24 where the drug is a specific inhibitor of platelets including but not limited to aspirin, coumadin, calcium channel blockers or others.

28) A method of claim 24 where the drug consists of genetic materials including but not limited to anti-sense genetic materials or genes for the blockage of expression that will result in therapeutic efficacy.

29) A method of claim 24 where the drug consists of genetic materials that when incorporated into the cells will result in the expression of therapeutic proteins or materials.

30) A method in claims 1 and 9 whereas the drug is delivered into a solid tumor or infected tissue by the device via vascular or other access passages.

31) A method of claim 30 whereas the drug is a anti-neoplastic or chemotherapeutic agent such as but not limited to adriamycin, mitomycin C, cisplatin or others.

32) A method of claim 30 whereas the drug is genetic or anti-sense materials designed to block the expression of oncogenes or other genes that participate in the disease process.

33) A method of claim 30 whereas the drug is a analgesic or pain controlling substance.

- 34) A method of claim 30 whereas the drug is a protein or peptide.
- 35) A method of claim 30 whereas the drug is a radionuclide or radionuclide labeled material.
- 36) A method of claim 30 whereas the drug is a anti-microbial or anti-viral agent for the local treatment of infected tissue.
- 37) A method in claims 1 and 9 whereas the drug is delivered into a solid anoxic tissue.
- 38) A method of claim 37 where the drug is genetic material designed to produce angiogenesis or the growth of new blood vessels.
- 39) A method of claims 36,37, 30, and 24 whereas the drugs delivered are incorporated into a time release or controlled release matrix including but not limited to microspheres, nanospheres, liposomes, or other controlled release or time release matrixes which are known to those skilled in the art.
- 40) A method of claim 37 whereas the materials used for the controlled release materials is fibrinogen, albumin, gelatin, carbohydrates, platelets, red blood cells, synthetic polymers, inorganic salts, or other materials that are commonly used.
- 41) A method of claims 36, 37, 30, 24 whereas the drug is delivered in a physiological buffered or non-buffered solution.

This is a list of some additional claims that I would like to include in the patent. After your review of the additional drawings, photos and claims, I think that we should review the current application for ideas on how to improve it and whether we should file additional applications or add the claims to the current one. I have not been to particular about the numbering on the above claims and this will have to be reviewed. I am including photo slides of the current device along with a hand drawing of a invisioned device. Please review and feel free to contact me.



Donald F. Palme II
SCIMED Life Systems
(612) 494-1640

3/10/93

WILLIAN BRINKS OLDS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE

SUITE 3600

CHICAGO, ILLINOIS 60611-5599

TELEPHONE 312 321-4200

CABLE JUDICATURE CHICAGO

TELEX 254300

FACSIMILE 312 321-4299

March 16, 1993

WASHINGTON OFFICE

2000 K STREET, N.W.

SUITE 200

WASHINGTON, D.C. 20006-1809

TELEPHONE 202 429-0625

TELEX 650 383-5605

FACSIMILE 202 293-1850

ARLINGTON, VA. OFFICE

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2001 JEFFERSON DAVIS HWY.

ARLINGTON, VIRGINIA 22202-3603

TELEPHONE 703 521-1177

TELEX 140994

FACSIMILE 703 466-0187

INDIANAPOLIS OFFICE

ONE INDIANA SQUARE

SUITE 3160

INDIANAPOLIS, INDIANA 46204-2001

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TELEX 469632

FACSIMILE 317 634-6701

TOLEDO OFFICE

1130 EDISON PLAZA

TOLEDO, OHIO 43604-1537

TELEPHONE 419 244-6578

TELEX 140342

FACSIMILE 419 244-8862

KARL A. VICK

(312) 321-4247

Mr. Donald F. Palme II
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, Minnesota 55311-3648

Re: Our Case No. 3570/216 - Linden et al.
U.S. Application Serial No. 07/913,227
INTRA-EXTRAVASCULAR DRUG DELIVERY
CATHETER AND METHOD

Dear Don:

We have received a first Office Action from the Patent and Trademark Office concerning the above-identified application. Enclosed is a copy of the Office Action, along with the patents cited therein.

In summary, the Office Action advises us of certain conclusions reached by the Examiner concerning the application, and that our response to this communication should be filed by April 11, 1993. Three one month extensions are available upon payment of the required extension fees. Thus, the absolute latest date to respond is July 11, 1993.

As you will see from subsequent pages of the Office Action, the Examiner objects to the application for various formal reasons, and rejects certain of the claims based on certain of the enclosed patents. This is all quite normal.

Please review the patents cited by the Examiner, paying particular attention to Hawkins et al., Sewell, Jr. and Bogue et al., then outline for us the ways in which these patented structures fail to disclose or teach the invention disclosed in your application.

Mr. Donald F. Palme II
March 16, 1993
Page 2

With this information we should be able to prepare a response to the Examiner.

Please call me if you have any questions.

Sincerely,

A handwritten signature in cursive script that reads "Karl".

Karl A. Vick

KAV/sk
Enclosures

WILLIAM BRINKS OLDS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

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INDIANAPOLIS OFFICE
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INDIANAPOLIS, INDIANA 46204-2013
TELEPHONE 317 636-0886
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TOLEDO OFFICE
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TELEPHONE 419 244-6578
TELEX 140342
FACSIMILE 419 244-8862

January 21, 1993

APR 22 2002

Ms. Patrice M. Stromberg
Legal Assistant
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, Minnesota 55311-3648

Re: Our Case No. 3570/216 - Linden et al.
U.S. Application Serial No. 07/913,227
INTRA-EXTRAVASCULAR DRUG DELIVERY
CATHETER AND METHOD

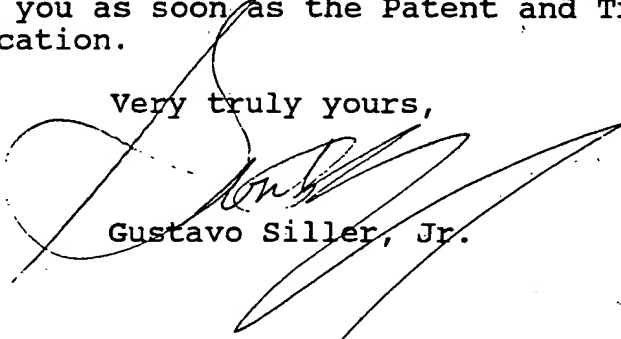
Dear Pat:

Enclosed for your files is the original Assignment conveying title in the above-identified United States patent application to SciMed Life Systems, Inc. This Assignment was recorded in the United States Patent and Trademark Office on August 26, 1992, on Reel 6241, Frames 0428-0431. We suggest that this Assignment be kept with your company's valuable papers.

It will be appreciated if you would sign and return the enclosed copy of the letter acknowledging receipt of the Assignment.

We will advise you as soon as the Patent and Trademark Office acts on the application.

Very truly yours,


Gustavo Siller, Jr.

GS/nhb
Enclosure
cc: Thomas Hektner

I hereby acknowledge receipt of the above-identified Assignment this _____ day of _____, 19__.

(Signature)

bcc: Jeannine Bowen

WILLIAM BRINKS OLDS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

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CHICAGO, ILLINOIS 60611-5599

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December 7, 1992

INDIANAPOLIS OFFICE

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TELEPHONE 317 636-0886

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ARLINGTON, VIRGINIA 22202-3603
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FACSIMILE 703 486-0187

KARL A. VICK

(312) 321-4247

Mr. Bradley C. Linden
Mr. Donald F. Palme III
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, Minnesota 55311-3648

APR 22 2002

Re: U.S. Application Serial No. 07/913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our File No. 3570/216

Dear Brad and Don:


Gus Siller asked me to prepare the enclosed Preliminary Amendment which presents a more detailed set of claims for the above-identified invention. I have already filed the Amendment with the Patent and Trademark Office in order to get the new claims to the Examiner before he/she is extremely far along with the search and examination. We can, however, submit further amendments if more changes or additions are desired.

Accordingly, please review the enclosed Preliminary Amendment and let me have your comments. Please keep in mind that if we desire to enter changes in a Preliminary Amendment, the changes must be submitted before the first Office Action on the merits. Unfortunately, there is no way of knowing when the first Office Action will be completed. My personal estimate is that the average time for receiving a first Office Action is 6 to 8 months after filing. Of course, we can also submit changes after the first Office Action unless the first Office Action is an allowance.

SciMed Life Systems, Inc.
December 7, 1992
Page 2

I look forward to hearing from you.

Sincerely,



Karl A. Vick

KAV/law
Enclosure

cc: Patrice M. Stromberg (w/o enclosure)
Mr. Gustavo Siller, Jr. (w/o enclosure)
Ms. Jeannine Bowen (w/o enclosure)

WILLIAN BRINKS OLDS HOFER GILSON & LIONE

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TOLEDO OFFICE

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TELEPHONE 419 244-6578

TELEX 140342

FACSIMILE 419 244-8862

October 6, 1992

Ms. Patrice M. Stromberg
Legal Assistant
SCIMED LIFE SYSTEMS, INC.
6655 Wedgwood Road
Maple Grove, MN 55369

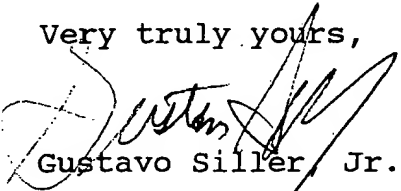
Re: Our Case No. 3570/216 - Linden et al.
U.S. Application Serial No. 07/913,227
INTRA-EXTRAVASCULAR DRUG DELIVERY
CATHETER AND METHOD

Dear Pat:

Enclosed for your files is a copy of the above-identified patent application as filed in the United States Patent and Trademark Office. This application has been assigned Serial No. 07/913,227, and has an official filing date of July 14, 1992.

We will advise you as soon as the Patent and Trademark Office acts on this application.

Very truly yours,


Gustavo Siller, Jr.

GS/ibr

Enclosure

cc: Thomas Hektner

bcc: Jeannine Bowen

GROUP

APPLICATION NUMBER

913227

NOTICE OF DRAFTSMAN'S PATENT DRAWING REVIEW

The PTO Draftsmen review all originally filed drawings regardless
of whether they were designated as Informal or formal.The drawings filed 7/14/92A. ☐ are approved.B. ☒ are objected to under 37 CFR 1.84 for reason(s) checked below. The examiner will require submission of new,
corrected drawings at the appropriate time. Corrected drawings must be submitted according to the instructions
listed on the back of this Notice.

1. Paper and ink. 37 CFR 1.84(a)

- ☐
- Poor Quality Paper. Must Be White.
-
- Transparent Paper Not Allowed.
-
- Sheet(s) _____

2. Size of Sheet and Margins. 37 CFR 1.84(b)

Acceptable Paper Sizes and Margins

Margin	Paper Size		
	8 1/2 by 14 inches	8 1/2 by 13 inches	DIN size A4 21 by 29.7 cm.
Top	2 inches	1 inch	2.5 cm.
Left	1/4 inch	1/4 inch	2.5 cm.
Right	1/4 inch	1/4 inch	1.5 cm.
Bottom	1/4 inch	1/4 inch	1.0 cm.

- ☐
- Proper Size Paper Required. All
-
- Sheets Must be Same Size.
-
- Sheet(s) _____

☒ Proper Margins Required.Sheet(s) Fig 1, 15, 16
☒ Top ☐ Right
☐ Left ☐ Bottom

3. Character of Lines. 37 CFR 1.84(c)

- ☒
- Lines Pale, Rough and Blurred, or
-
- Jagged. Fig(s)
- 1-16

- ☐
- Solid Black Shading Not Allowed.
-
- Fig(s) _____

4. ☐ Photographs Not Approved.

- ☐
- Comments:

5. Hatching and Shading. 37 CFR 1.84(d)

- ☐
- Shade Lines are Required.
-
- Fig(s) _____

- ☐
- Criss-Cross Hatching Not Allowed.
-
- Fig(s) _____

- ☐
- Double Line Hatching Not Allowed.
-
- Fig(s) _____

- ☐
- Parts in Section Must be Hatched
-
- Properly. Fig(s) _____

6. Reference Characters. 37 CFR 1.84(f)

- ☒
- Reference Characters Poor or Rough
-
- and Blurred. Fig(s)
- 1-16

- ☐
- Minimum 1/8 inch (3.2 mm.) in height
-
- is required. Fig(s) _____

- ☒
- Figure Legends Poor or Placed
-
- Incorrectly. Fig(s)
- 1-16

7. Views. 37 CFR 1.84(i) & (j)

- ☐
- Figures Must be Numbered Separately.

- ☐
- Figures Must Not be Connected
-
- Fig(s) _____

8. Identification of Drawings: 37 CFR 1.84(l)

- ☒
- Extraneous Matter or Copy Machine
-
- Marks Not Allowed. Fig(s)
- 1-16

- 9.
- ☐
- Changes Not Completed from Prior
-
- PTO-948 dated _____

Telephone inquiries concerning this review should be directed to the Chief Draftsman at telephone number (703) 557-6404.

Reviewing Draftsman

Date

KAV

MEMORANDUM

TO: **DOCKET DEPARTMENT**

Abandon/Close Docket No. 3570/216, per
Luke Dohmer of Scimed instructions.

Case abandoned in favor of Docket No. 3570/343.
Keep 216 and 343 together

Karl Vick
Attorney Signature

7-1-94
Date

KAV

MEMORANDUM

TO: DOCKET DEPARTMENT

Abandon/Close Docket No. 3570/216, per
Client (Luke Dohman) instructions. FWC
Case abandoned in favor of Docket No. 3570/343.

Karl Vlach
Attorney Signature

9/21/94
Date

WILLIAN BRINKS OLDS HOFER GILSON & LIONE

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WASHINGTON OFFICE

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TELEX 650 383-5605

FACSIMILE 202 293-1850

ARLINGTON, VA. OFFICE

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2001 JEFFERSON DAVIS HWY.

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TELEX 140994

FACSIMILE 703 486-0187

GUSTAVO SILLER, JR.

(312) 321-4249

July 30, 1992

VIA FEDERAL EXPRESS

APR 22 2002

Ms. Patrice Stromberg
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, MN 55369

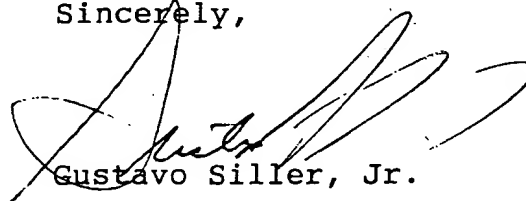
Re: U.S. Patent Application for
INTRA-EXTRAVASCULAR DRUG
DELIVERY CATHETER AND METHOD
Serial No.: 07/913,227
Filed: July 14, 1992

Dear Pat:

Please obtain the signatures of Brad Linden and Donald
Palme II on the enclosed Assignment and Declaration and have the
appropriate person at SciMed execute the Power of Attorney.

Should you have questions regarding the enclosed or any
other matters, please do not hesitate to give me a call.

Sincerely,



Gustavo Siller, Jr.

GS, Jr./pdn
Enclosure

Inventor(s): Bradley C. Linden and Donald F. Palme II

Title: INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD

POWER OF ATTORNEY

The specification of the above-identified patent application:



is attached hereto

was filed on July 14, 1992 as application Serial No. 07/913,227

I hereby appoint the following attorneys to prosecute the patent application identified above and to transact all business in the Patent and Trademark Office connected therewith:

Henry L. Brinks	(Reg. No. 17,013)	Steven P. Shurtz	(Reg. No. 31,424)
Clyde F. Willian	(Reg. No. 18,456)	Rodney A. Daniel	(Reg. No. 31,605)
Roy E. Hofer	(Reg. No. 19,391)	Jeffery M. Duncan	(Reg. No. 31,609)
Richard G. Lione	(Reg. No. 19,795)	Thomas J. Filarski	(Reg. No. 31,612)
F. David AuBuchon	(Reg. No. 20,493)	Glen P. Belvis	(Reg. No. 31,735)
James B. Blanchard	(Reg. No. 21,054)	Hugh A. Abrams	(Reg. No. 31,937)
Melvin F. Jager	(Reg. No. 22,131)	Harold V. Johnson	(Reg. No. 31,972)
Robert L. Harmon	(Reg. No. 22,762)	Gustavo Siller, Jr.	(Reg. No. 32,305)
David A. Anderson	(Reg. No. 24,115)	Charles L. Roberts	(Reg. No. 32,434)
Jack C. Berenzweig	(Reg. No. 24,569)	Maxwell J. Petersen	(Reg. No. 32,772)
Raymond W. Green	(Reg. No. 24,587)	Frank J. Kozak	(Reg. No. 32,908)
John L. Cline	(Reg. No. 25,421)	Karl A. Vick	(Reg. No. 33,288)
Jerold A. Jacover	(Reg. No. 26,284)	Bradley G. Lane	(Reg. No. 33,411)
John J. Pavlak	(Reg. No. 26,785)	Lawrence M. Kaplan	(Reg. No. 33,521)
John K. Lucas	(Reg. No. 27,024)	Timothy Q. Delaney	(Reg. No. 33,674)
Allan J. Sternstein	(Reg. No. 27,396)	Barbara J. Luther	(Reg. No. 33,954)
John R. Crossan	(Reg. No. 27,433)	Frank C. Nicholas	(Reg. No. 33,983)
Steven Z. Szczepanski	(Reg. No. 27,957)	Ralph J. Gabric	(Reg. No. 34,167)
Gary M. Ropski	(Reg. No. 28,257)	Natalie D. Kadievitch	(Reg. No. 34,196)
William A. Webb	(Reg. No. 28,277)	Gregory L. Bradley	(Reg. No. 34,299)
Joel W. Benson	(Reg. No. 29,002)	Gary L. Hermanson	(Reg. No. 34,349)
William H. Frankel	(Reg. No. 30,337)	G. Peter Nichols	(Reg. No. 34,401)
Richard A. Kaplan	(Reg. No. 30,563)	Jonathan E. Retsky	(Reg. No. 34,415)
Michael H. Baniak	(Reg. No. 30,608)	Michael J. Jaro	(Reg. No. 34,472)
James R. Sobieraj	(Reg. No. 30,805)	John C. Freeman	(Reg. No. 34,483)
John A. Crook III	(Reg. No. 30,830)	William F. Prendergast	(Reg. No. 34,699)
Robert W. Stevenson	(Reg. No. 31,064)	Michael E. Milz	(Reg. No. 34,880)
Wannell M. Crook	(Reg. No. 31,071)	Donna M. Rogers	(Reg. No. 34,913)
Richard A. Cederth	(Reg. No. 31,336)		

Please address all correspondence and telephone calls to Gustavo Siller, Jr. in care of:

WILLIAM BRINKS OLDS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

The undersigned hereby authorizes the U.S. attorneys named herein to accept and follow instructions from William Brinks Olds Hofer Gilson & Lione as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by the undersigned.

(check one)



Inventor(s)



Owner by Assignment

Date: _____ SCIMED LIFE SYSTEMS, INC.
Assignee

Date: _____ Signature

Date: _____ Name, Title

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD, the specification of which:

_____ is attached hereto.

X was filed on July 14, 1992 as Application Serial No. 07/913,227

_____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)Priority Claimed

<u>(Number)</u>	<u>(Country)</u>	<u>(Day/Month/Year Filed)</u>	<u>Yes</u>	<u>No</u>
-----------------	------------------	-------------------------------	------------	-----------

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

<u>(Application Serial No.)</u>	<u>(Filing Date)</u>	<u>(Status-patented, pending, abandoned)</u>
---------------------------------	----------------------	--

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Inventor's Signature
Full name of sole or first inventor
Residence
Citizenship
Post Office Address

Date _____
Bradley C. Linden
Eden Prairie, Minnesota
United States
15601 Oak Ridge Road
Eden Prairie, Minnesota 55346

Inventor's Signature
Full name of second joint inventor, if any
Residence
Citizenship
Post Office Address

Date _____
Donald F. Palme II
Dayton, Minnesota
United States
13820 Balsam Lane
Dayton, Minnesota 55327

WILLIAM BRINKS OLDS HOFER GILSON & LIONE
P.O. Box 10395
Chicago, IL 60610
(312) 321-4200

Serial No.: 07/913,227
Filing Date: July 14, 1992

Case No. 3570/216

ASSIGNMENT

WHEREAS, Bradley C. Linden and Donald F. Palme II, hereinafter called the "Assignors", have jointly invented a new and useful INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD, for a full description of which reference is ~~here~~ made U.S. Patent Application Serial No. 07/913,227, filed July 14, 1992; and in

WHEREAS, SciMed Life Systems, Inc., a corporation organized and existing under the laws of the State of Minnesota, having a place of business in the City of Maple Grove, State of Minnesota, hereinafter called the "Assignee", is desirous of acquiring the entire right, title and interest in and to said invention, the application above identified, and in, to and under Letters Patent which may be obtained for said invention, as hereinafter more fully set forth;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, be it known that for and in consideration of the sum of One Dollar (\$1.00), and other valuable and legally sufficient considerations, the receipt of which by the Assignors from the Assignee is hereby acknowledged, the Assignors have sold, assigned and transferred, and by these presents do sell, assign and transfer unto the Assignee, the entire right, title and interest for the United States in and to the invention and application hereinabove identified, and any Letters Patent of the United States that may issue for said invention, together with the entire right, title and interest in and to said invention and application for Letters Patent and Letters Patent therefor, in all countries foreign to the United States, including the full right to claim for any such application all benefits and priority rights under any applicable convention; to have and to hold for the sole and exclusive use and benefit of the Assignee, its successors and assigns, to the full end of the term or terms for which any and all of said Letters Patent for said invention may issue.

And the Assignors do hereby covenant and agree, for themselves and their legal representatives, that they will assist their Assignee in the prosecution of the application herein identified; in the making and prosecution of any other applications for Letters Patent that the Assignee may elect to make covering the invention herein identified, as hereinbefore set forth; in vesting in the Assignee like exclusive title in and to all such other applications and Letters Patent; and in the prosecution of any interference which may arise involving said invention, or any application or Letters Patent herein contemplated; and that they will execute and deliver to the Assignee any and all additional papers which may be requested by the Assignee to fully carry out the terms of this Assignment.

And the Commissioner of Patents and Trademarks is hereby authorized and requested to issue Letters Patent to the Assignee in accordance with the terms of this Assignment.

IN TESTIMONY WHEREOF, the Assignors have hereunto set their hands and affixed their seals.

DATE: _____

Bradley C. Linden (SEAL)

DATE: _____

Donald F. Palme II (SEAL)

STATE OF MINNESOTA)
) ss.
COUNTY OF _____)

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that Bradley C. Linden, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that he signed, sealed and delivered the said instrument as his free and voluntary act for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and Notarial Seal, this _____ day of _____, 1992.

Notary Public

(SEAL)

My Commission Expires: _____

STATE OF _____)
) ss.
COUNTY OF _____)

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that Donald F. Palme II, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that he signed, sealed and delivered the said instrument as his free and voluntary act for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and Notarial Seal, this _____ day of _____, 1992.

Notary Public

(SEAL)

My Commission Expires: _____

WILLIAM BRINKS OLDS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE

SUITE 3600

CHICAGO, ILLINOIS 60611-5599

TELEPHONE 312 321-4200

CABLE JUDICATURE CHICAGO

TELEX 254300

FACSIMILE 312 321-4299

INDIANAPOLIS OFFICE

ONE INDIANA SQUARE

SUITE 3160

INDIANAPOLIS, INDIANA 46204-2001

TELEPHONE 317 636-0886

TELEX 469632

FACSIMILE 317 634-6701

TOLEDO OFFICE

1130 EDISON PLAZA

TOLEDO, OHIO 43604-1537

TELEPHONE 419 244-6578

TELEX 140342

FACSIMILE 419 244-8862

WASHINGTON OFFICE

2000 K STREET, N.W.

SUITE 200

WASHINGTON, D.C. 20006-1809

TELEPHONE 202 429-0625

TELEX 650 383-5605

FACSIMILE 202 293-1850

ARLINGTON, VA. OFFICE

CRYSTAL PLAZA ONE

SUITE 208

2001 JEFFERSON DAVIS HWY.

ARLINGTON, VIRGINIA 22202-3603

TELEPHONE 703 521-1177

TELEX 140984

FACSIMILE 703 486-0187

GUSTAVO SILLER, JR.

(312) 321-4249

July 27, 1992

VIA FEDERAL EXPRESS

APR 22 2002

Mr. Brad Linden
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, MN 55369

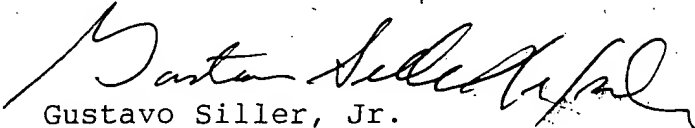
Re: U.S. Patent Application for
INTRA-EXTRAVASCULAR DRUG
DELIVERY CATHETER AND METHOD
Filed: July 14, 1992

Dear Brad:

Pursuant to our telephone conversation, enclosed is a complete copy of the application referenced above which was filed on July 14, 1992.

Please do not hesitate to contact me should you need anything further.

Sincerely,


Gustavo Siller, Jr.

GS, Jr./pdn
Enclosure

WILLIAM BRINKS OLDS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE
SUITE 3600

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INDIANAPOLIS OFFICE
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TELEPHONE 317 636-0886
TELEX 469632
FACSIMILE 317 634-6701

TOLEDO OFFICE
1130 EDISON PLAZA
TOLEDO, OHIO 43604-1537
TELEPHONE 419 244-6578
TELEX 140342
FACSIMILE 419 244-8862

GUSTAVO SILLER, JR.
(312) 321-4249

July 15, 1992

VIA FEDERAL EXPRESS

Mr. Brad Linden
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, MN 55369

Dear Brad:

Enclosed is the file you left in my office.

Sincerely,



Gustavo Siller, Jr.

GS, Jr./pdn
Enclosure

Restenosis Summit 1992

POLYMER STENTS

Speaker: Gershon Golomb, PH.D.

Syllabus:

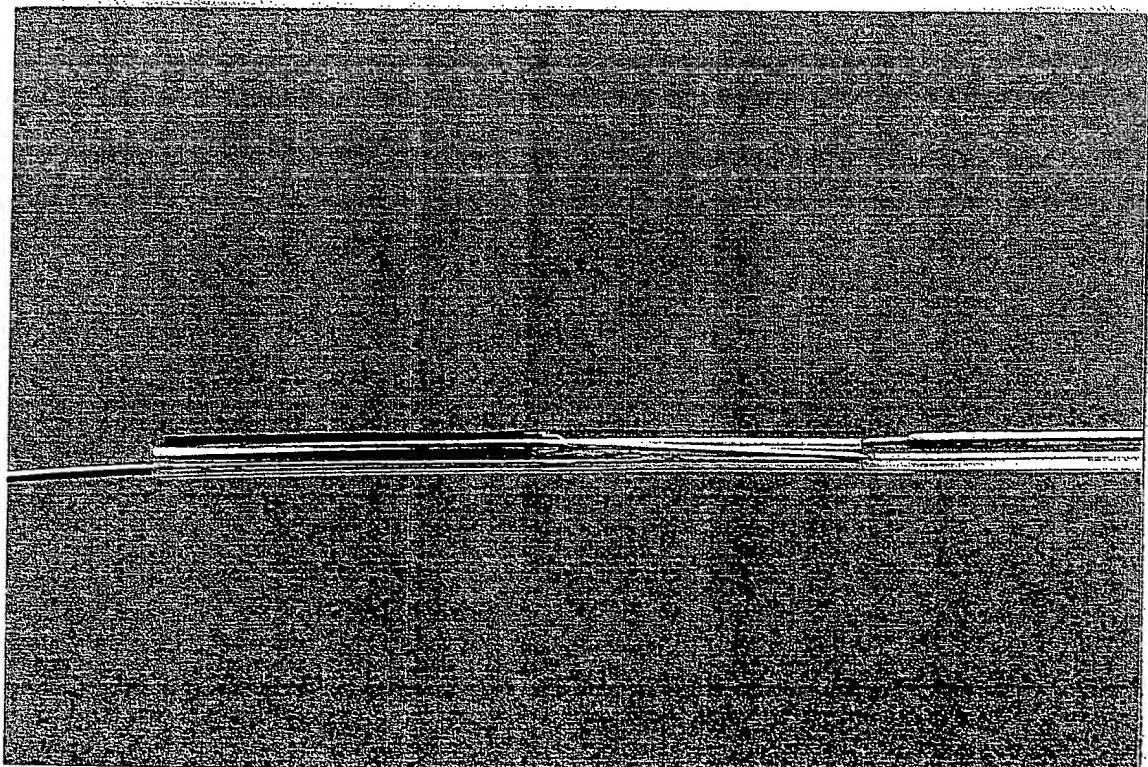
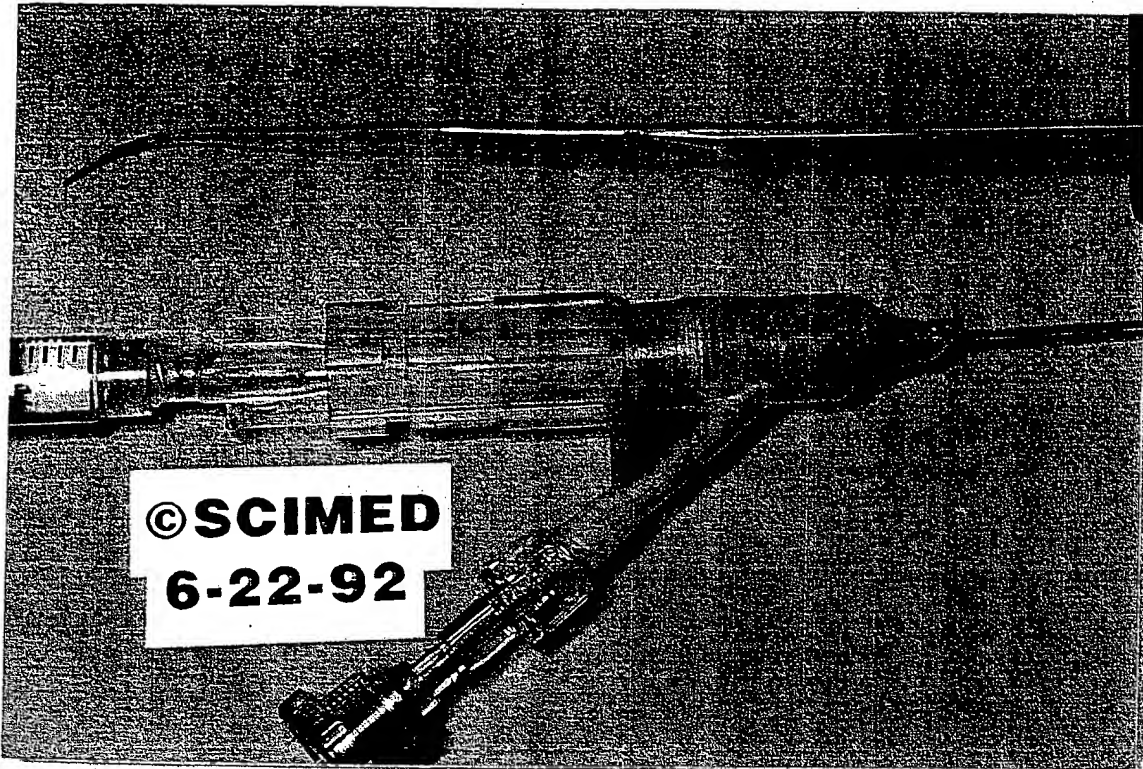
APR 22 2002

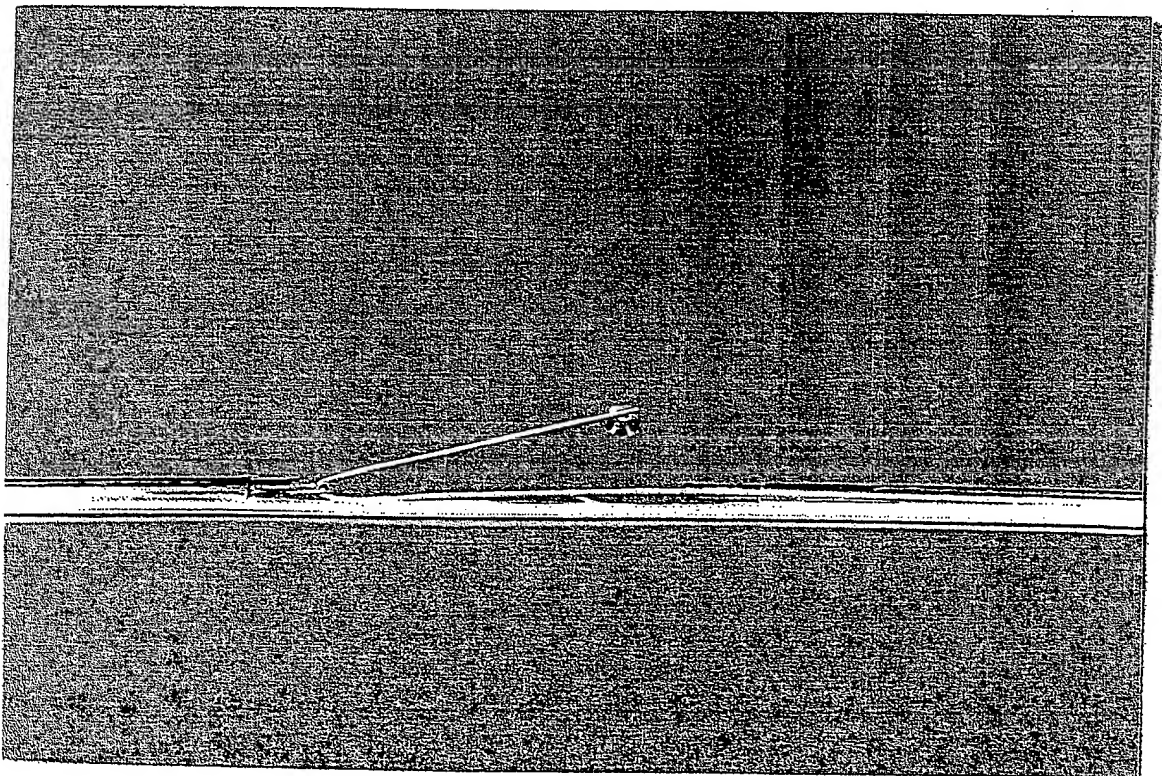
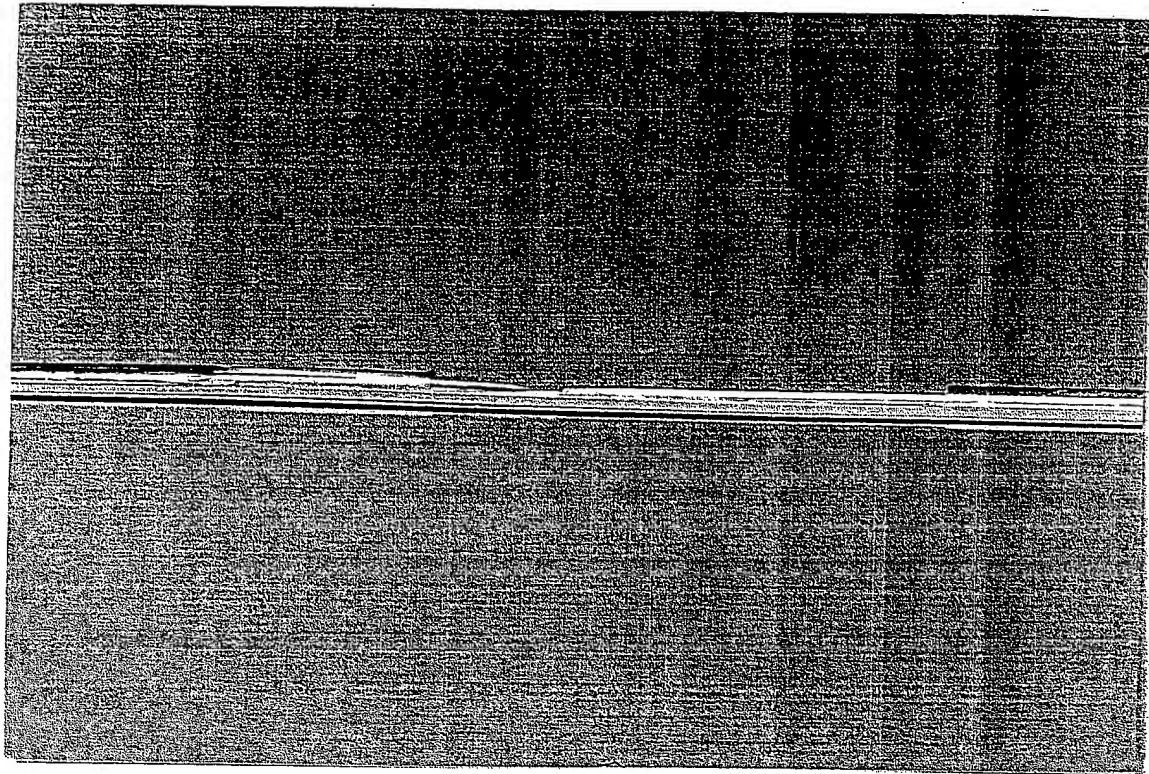
STRATEGIES FOR TREATING ARTERIAL RESTENOSIS USING POLYMERIC CONTROLLED RELEASE IMPLANTS

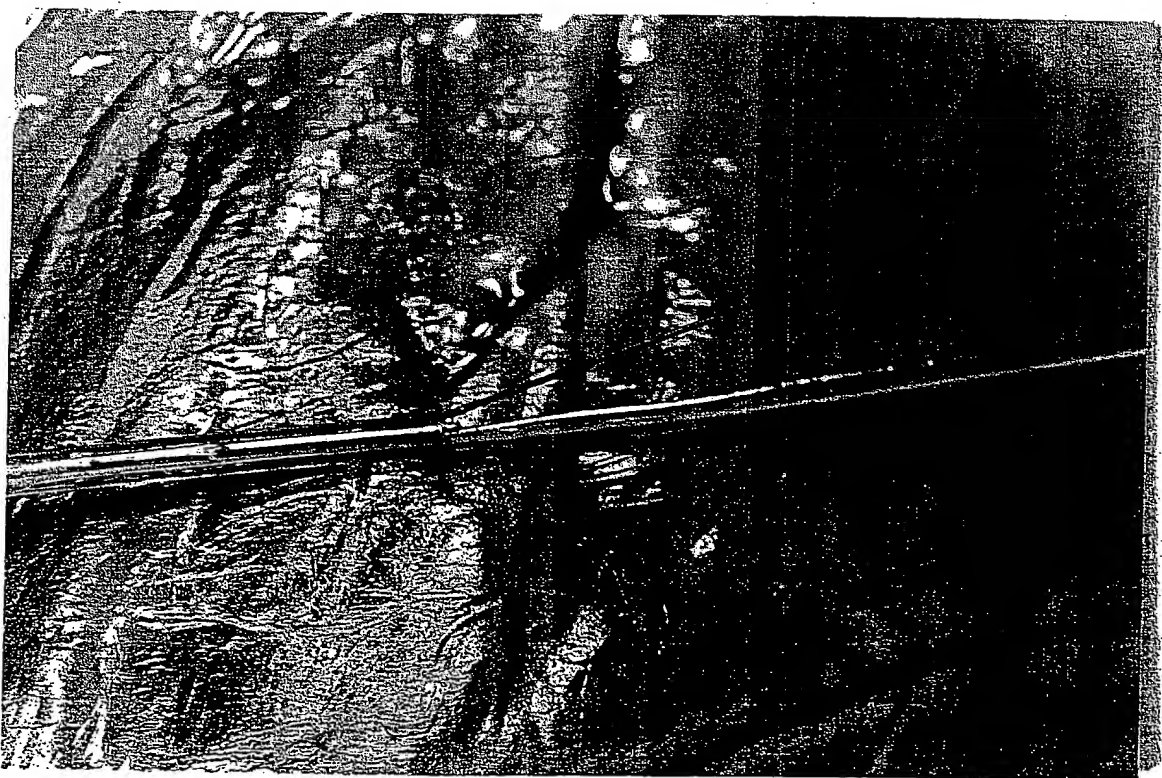
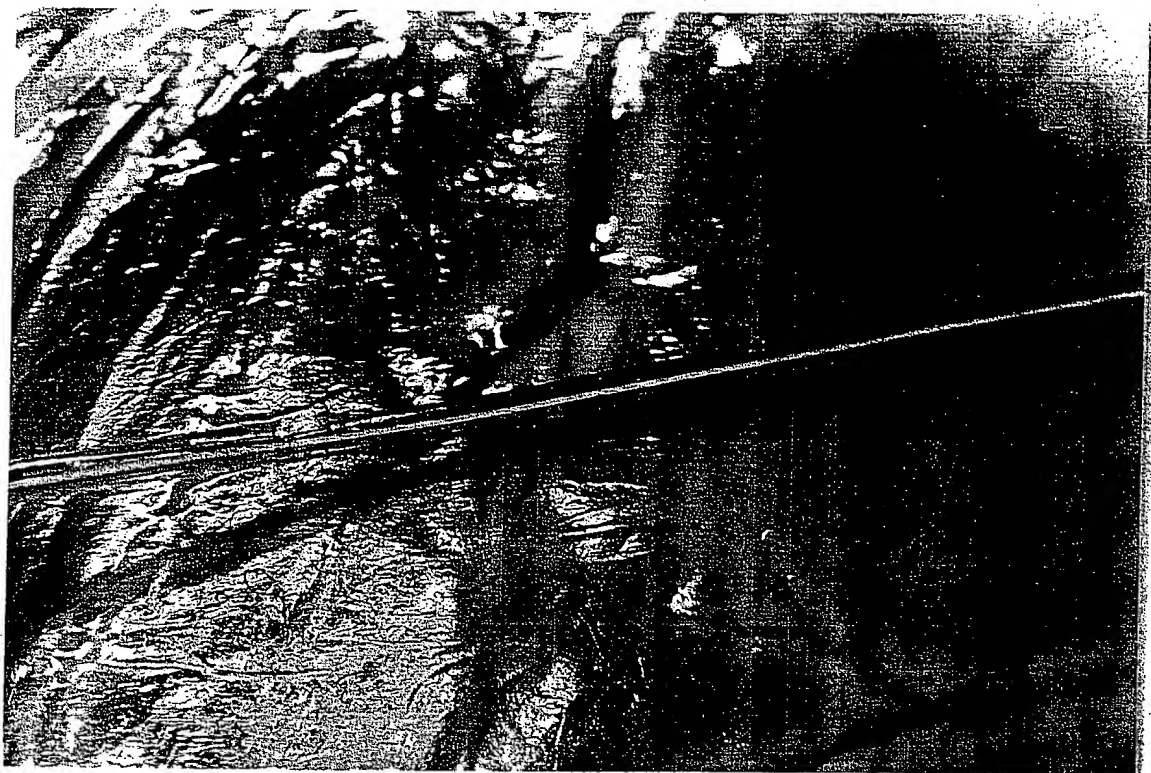
Robert J. Levy¹, Gershon Golomb², Joseph Trachy¹,
Vinod Labhasetwar¹, David Muller¹, and Eric Topol³

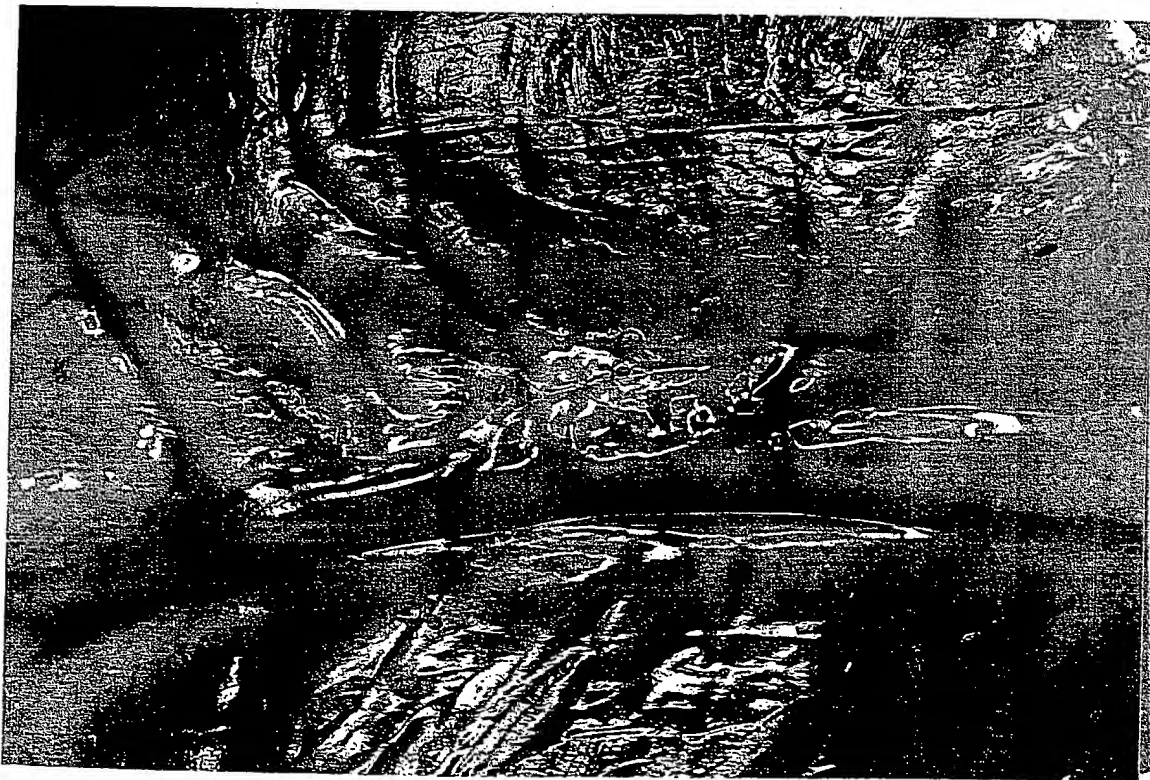
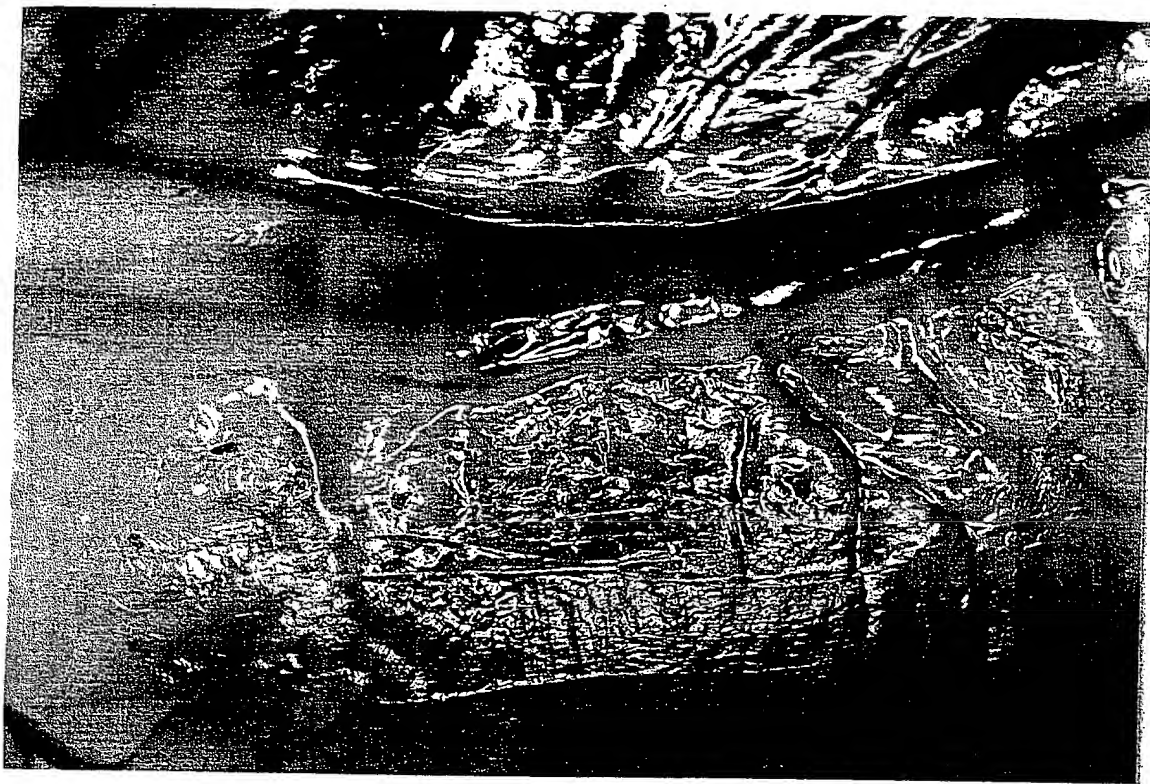
[In Press, Biotechnology and Bioactive Polymers,
ed. C. G. Gebelein, Plenum, N.Y.]

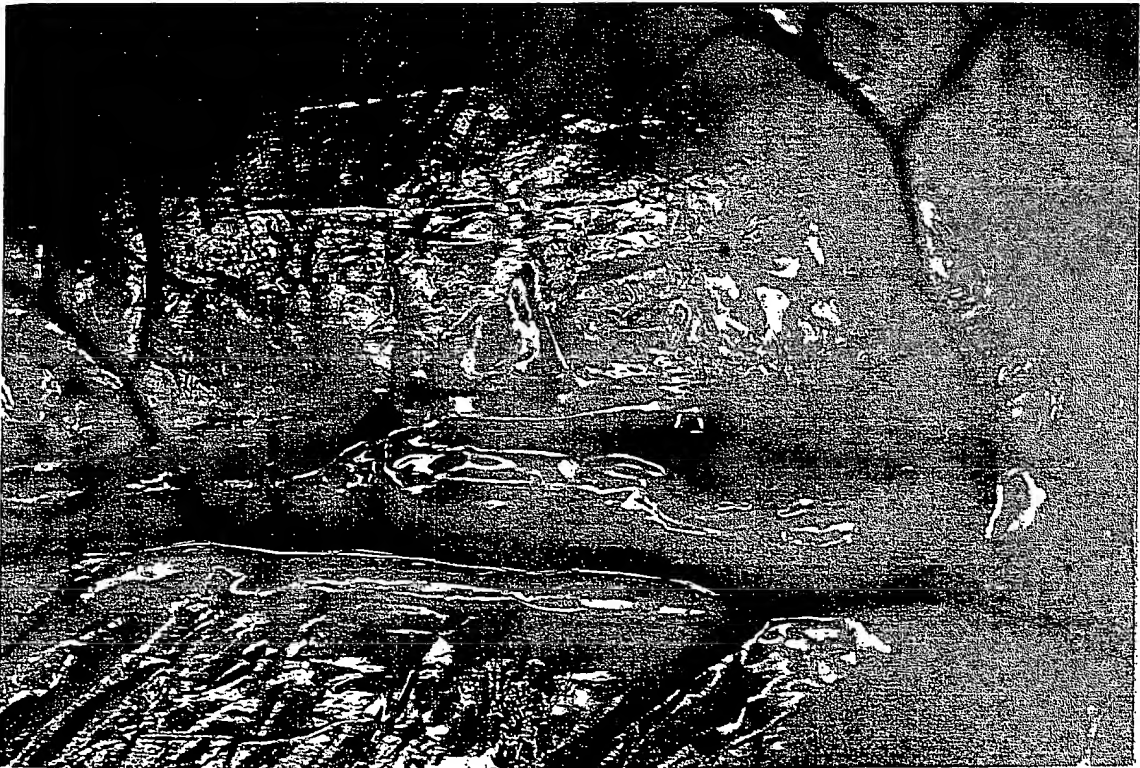
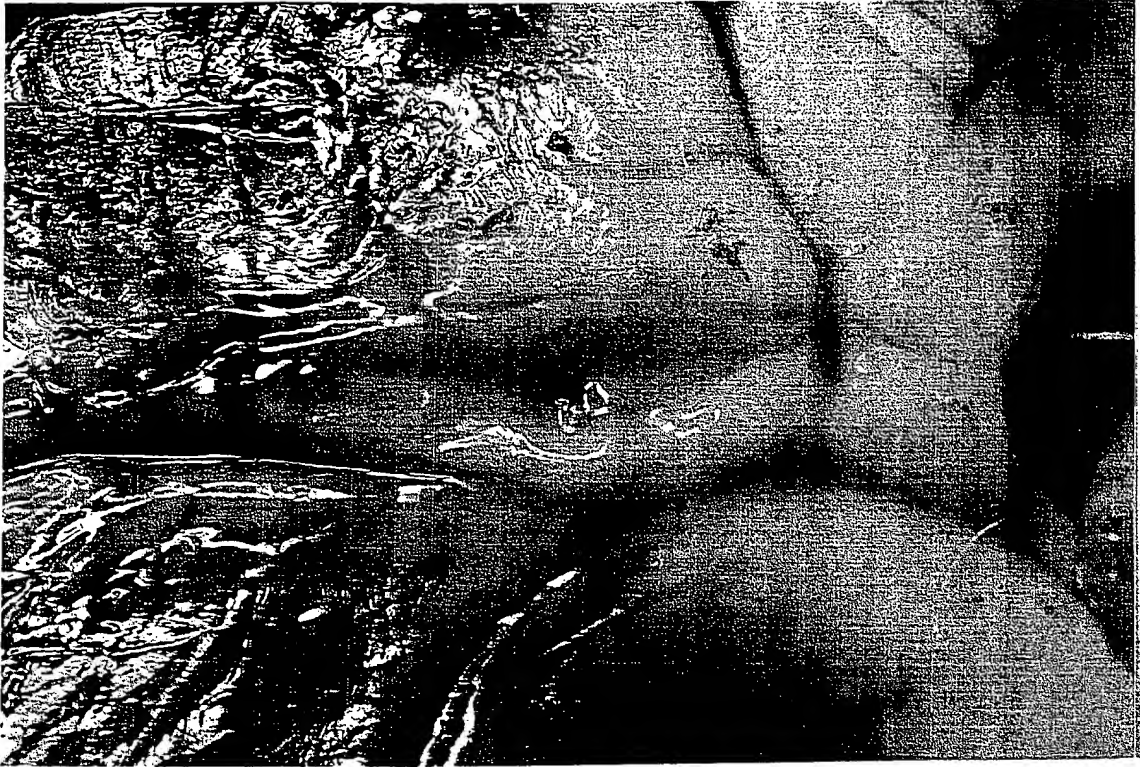
All of the above clinical strategies have also been investigated in various animal studies, which have indicated some preliminary benefit. Most recently, studies by Edelman and his colleagues, have demonstrated that periarterial drug administration using heparin-ethylenevinyl acetate composites significantly inhibited restenosis in a rat arterial injury model.^{11,12} This initial success of a controlled release drug delivery approach to restenosis has stimulated interest in the field. Controlled release drug implants have been used by our group and others to treat a variety of cardiovascular diseases, and this approach is uniquely suited for this general group of disorders.¹³ Controlled release may be defined as formulations of drug polymer composites, either as monolithic matrices or reservoirs with rate limiting membrane configurations, in which drug administration can be sustained through the use of polymeric materials. Implantation of controlled release polymer systems at the site of a cardiovascular disease process offers the advantages of regional high levels of drug, with optimal drug action, as well as lowering systemic drug exposure, and thereby minimizing the possibility of side effects.



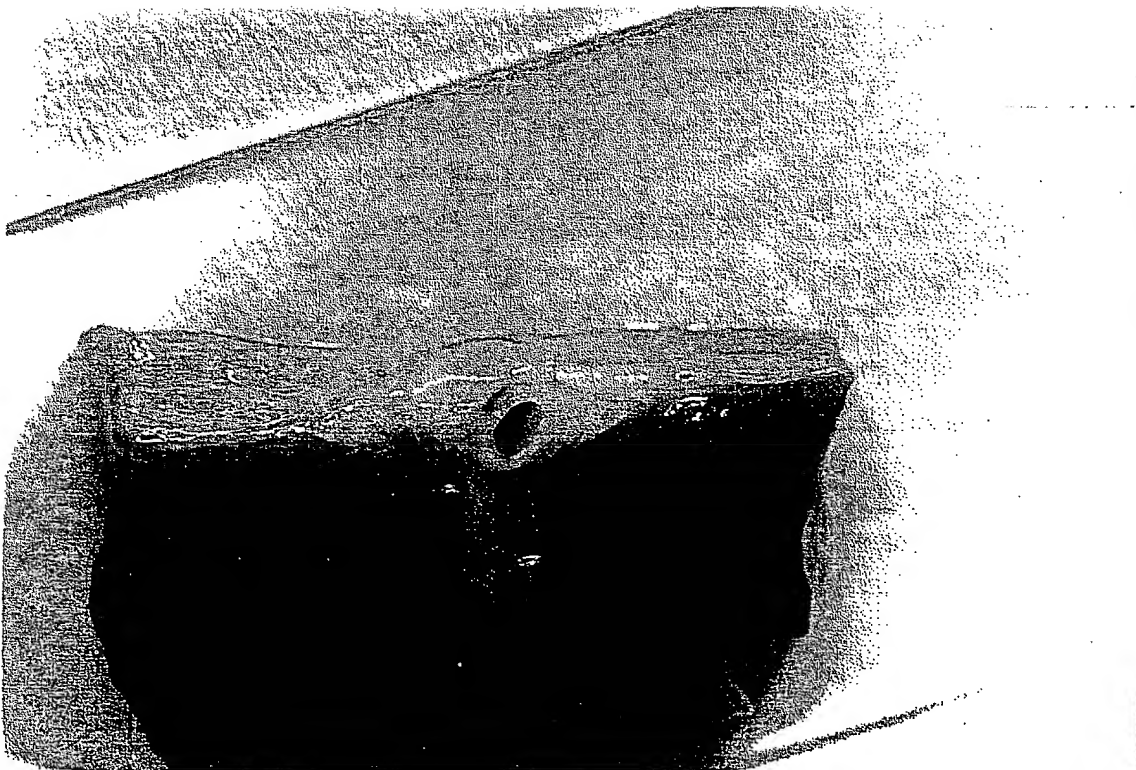
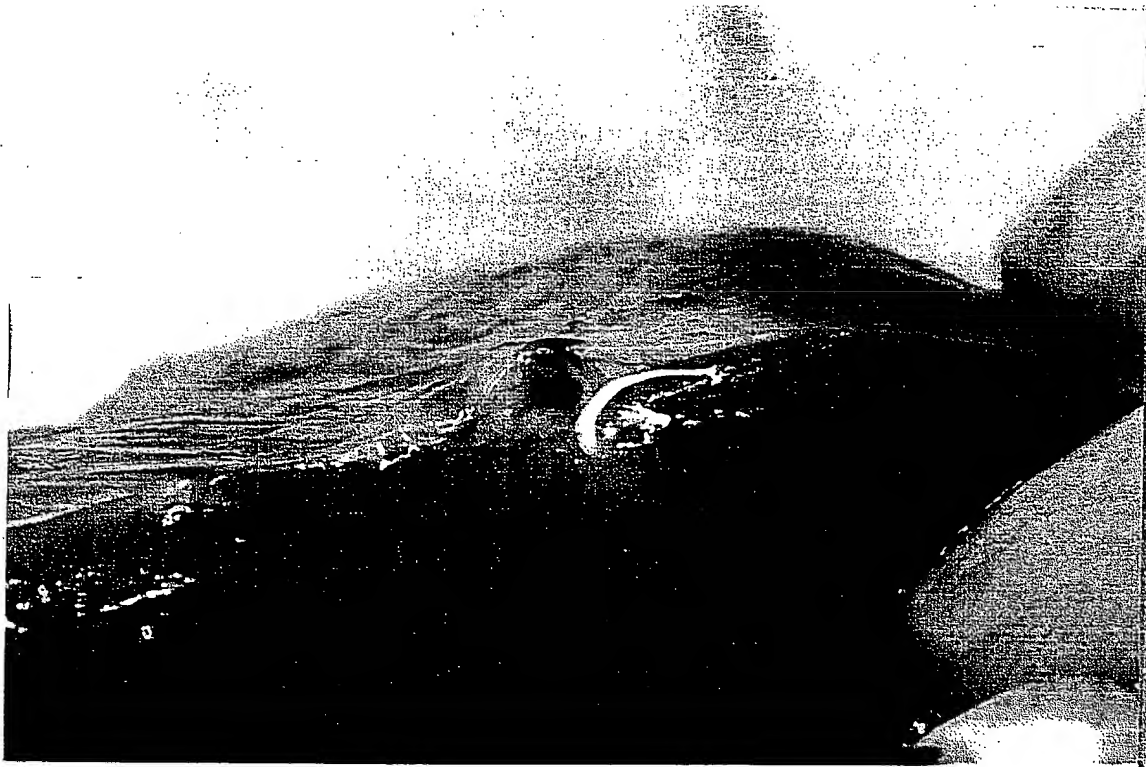




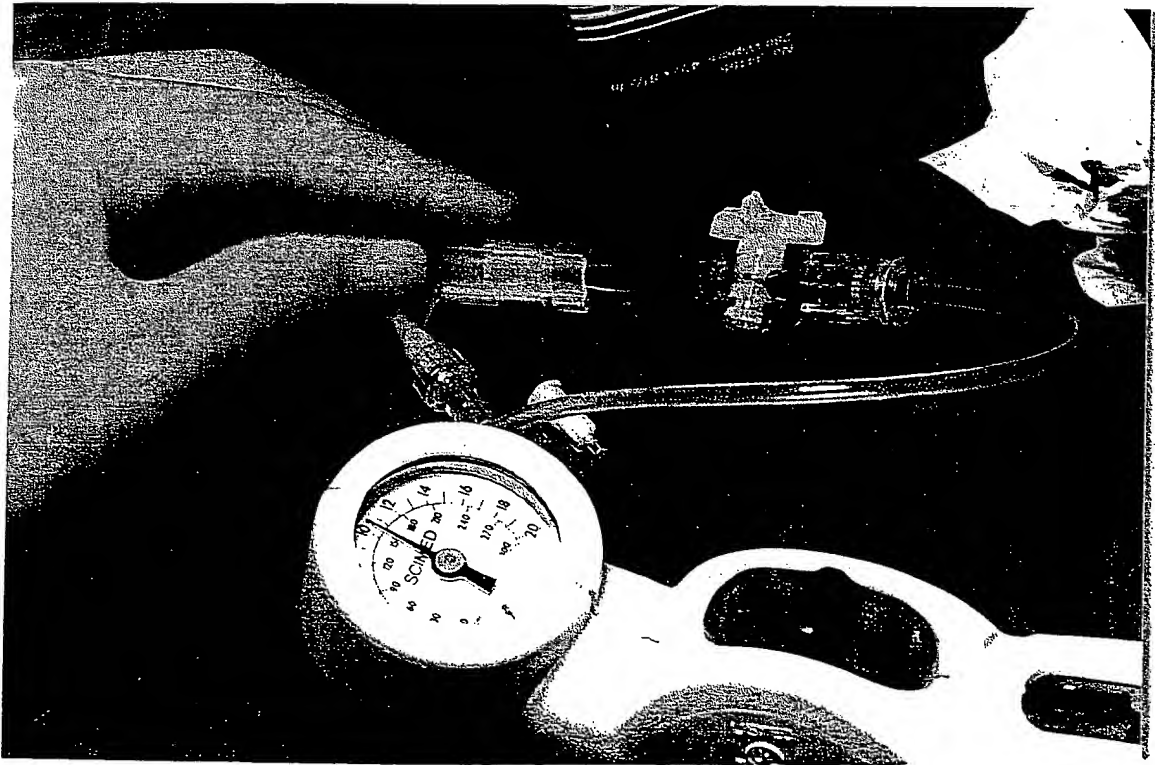




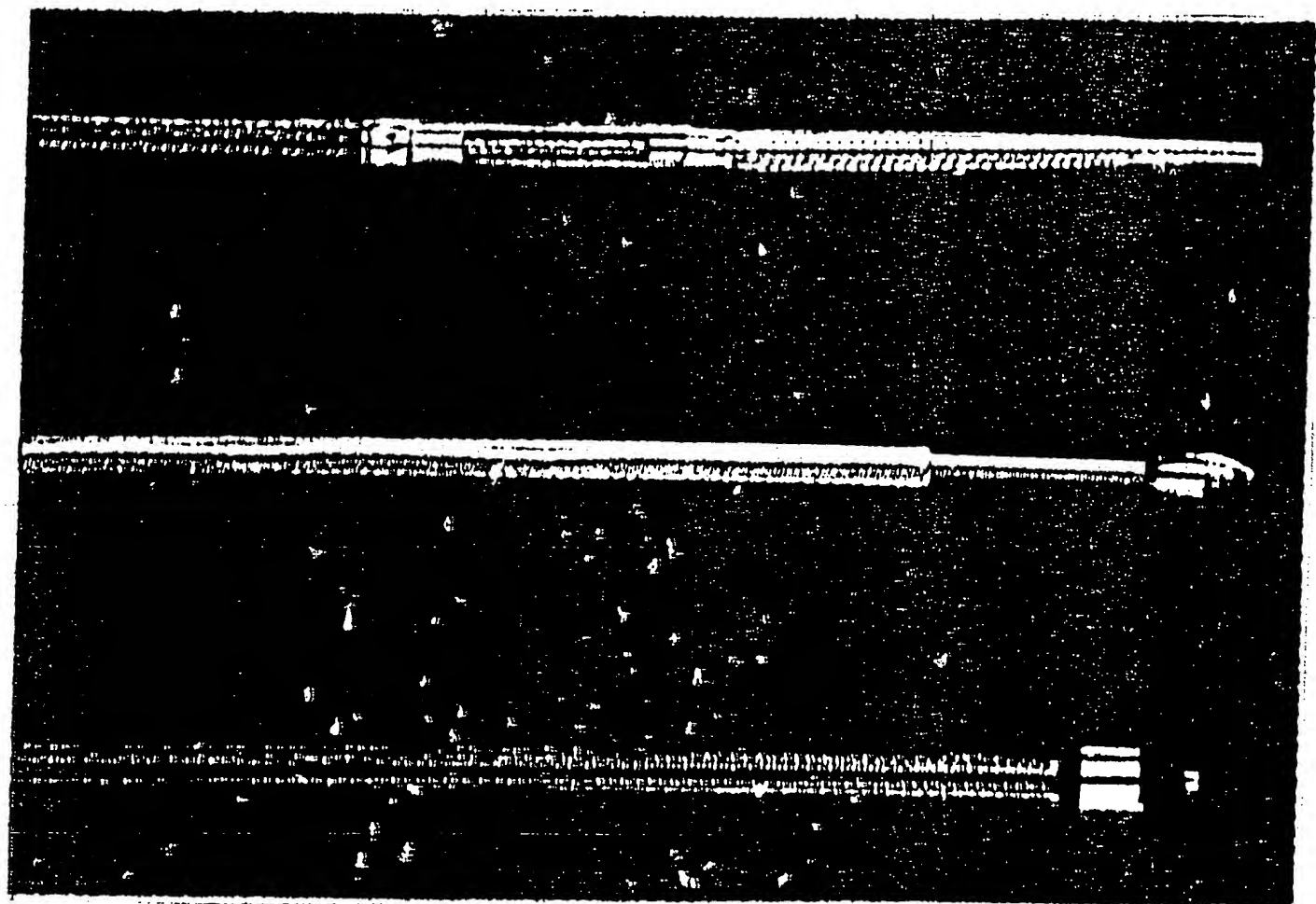


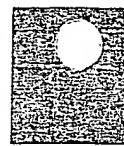
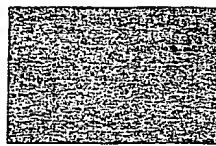












July 2, 1992

Gustavo Siller, Esq.
William Brinks Olds Hofer
Gilson & Lione
NBC Tower
455 North Cityfront Plaza Drive
Suite 3600
Chicago, IL 60611-5599

APR 22 2002

Re: Drug Delivery Concept

Dear Gus:

Enclosed is the additional disclosure that you requested on the drug delivery concept that you are working on. I am hoping that this will give you what you are looking for.

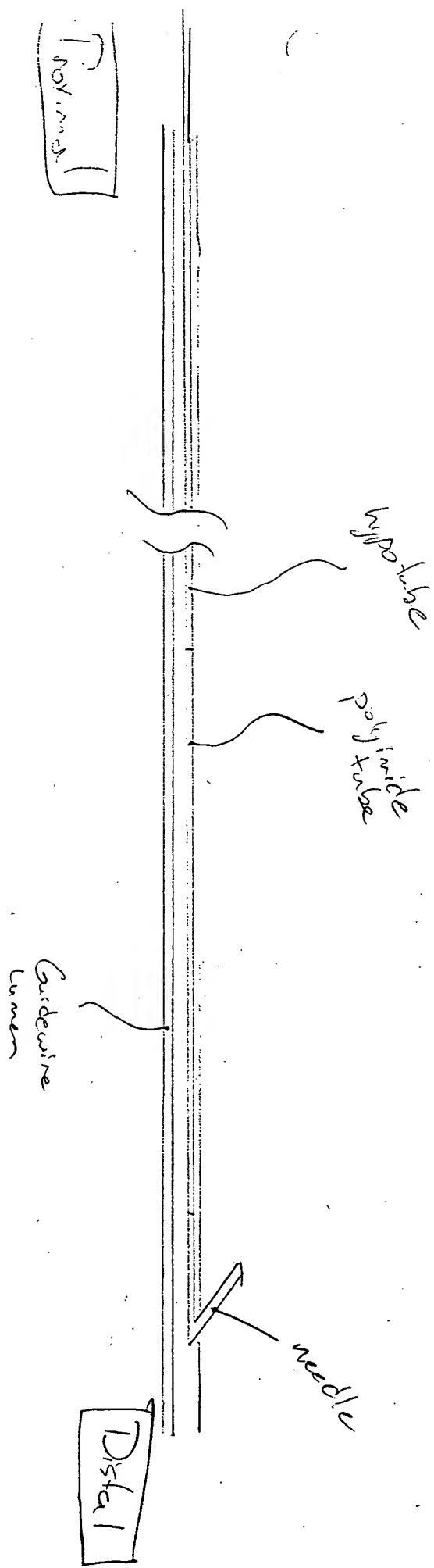
If you need any more information, or any clarification on the drawings that I am sending you, please feel free to call. I can be reached at (612) 420-0564. Thanks for all of your help in this matter.

Sincerely,

SCIMED LIFE SYSTEMS, INC.

Brad Linden
Biochemist

multiple communicating
hydrostatic materials



note

Distal tip

polyimide tubing

angulation can be changed for different cutting effects

Beveled needle point
(angulation of needle point can be varied for different cutting effects)

$L \approx \text{lumen}$

windows

large lumen
 $\approx .227$ inches
 $\approx .42$ inches

Proximal

Stainless Steel
hypotube



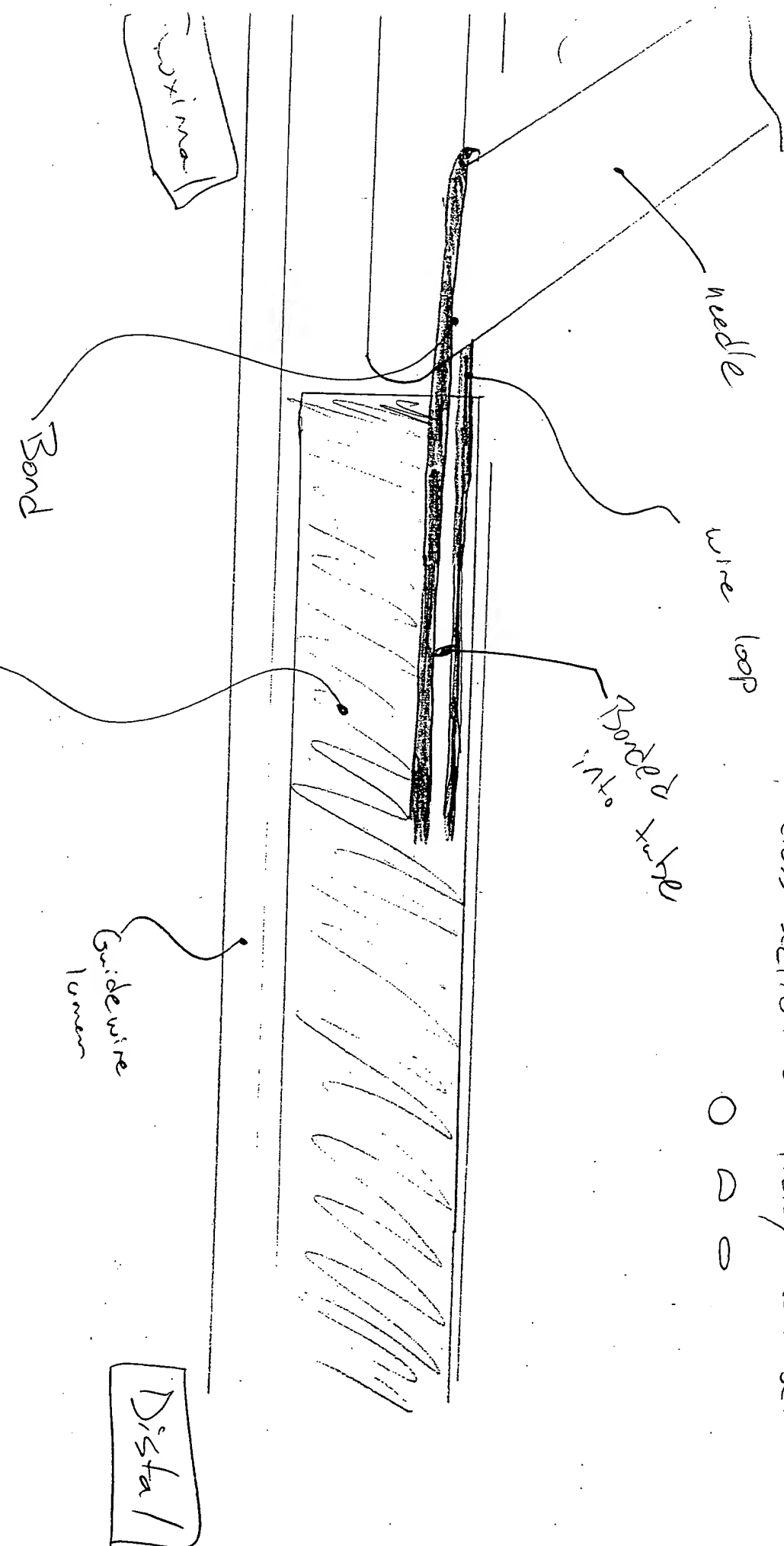
Dual Lumen
Cross-Section

Guidewire lumen
currently accepts .014" wire

Distal

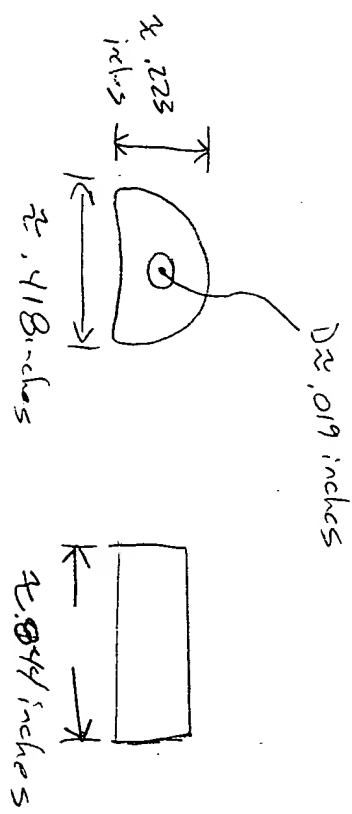
Tracking Trolley

cross section of trolley can be:

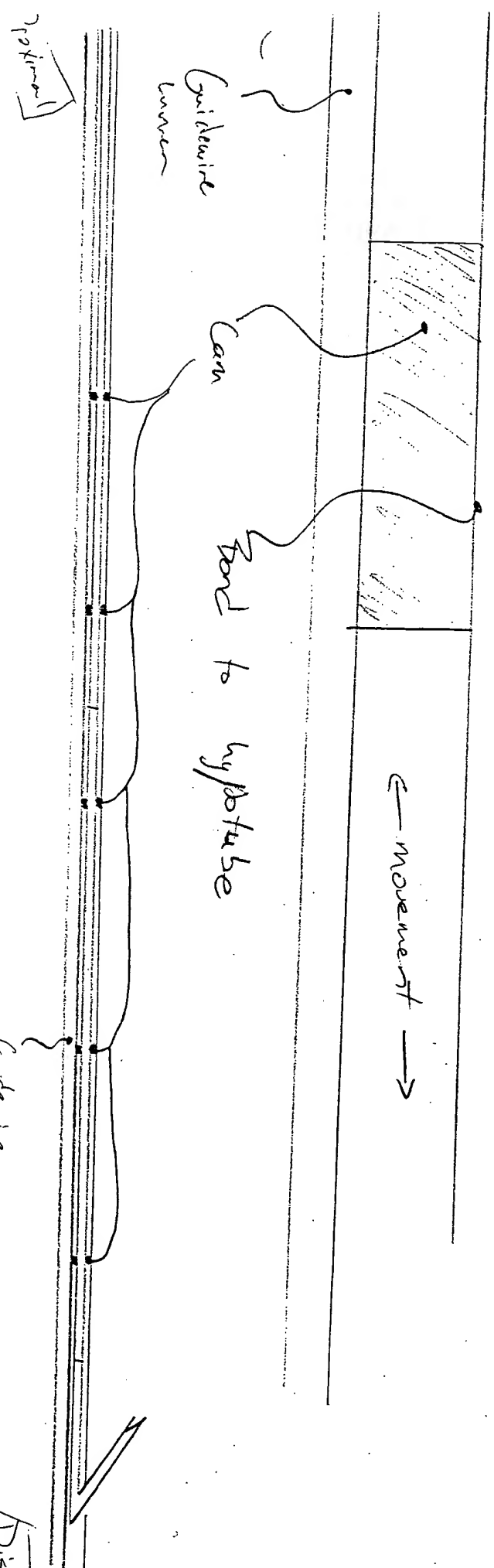


Purpose: Trolley guides the hypotube is, tubing filled with adhesive needle back into window when the

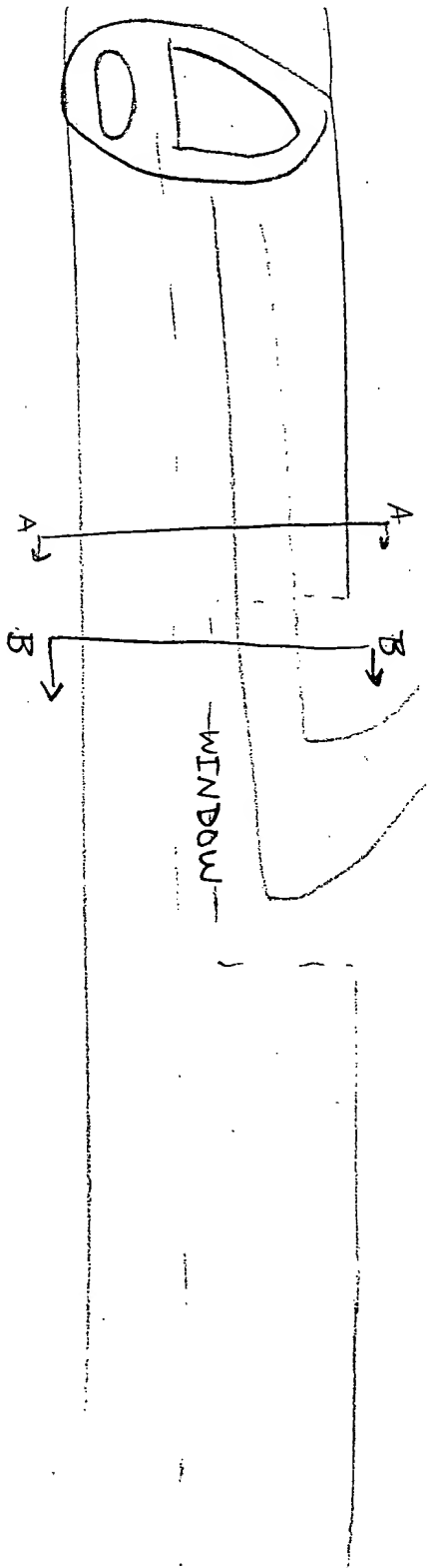
Anti-Rotation Cams



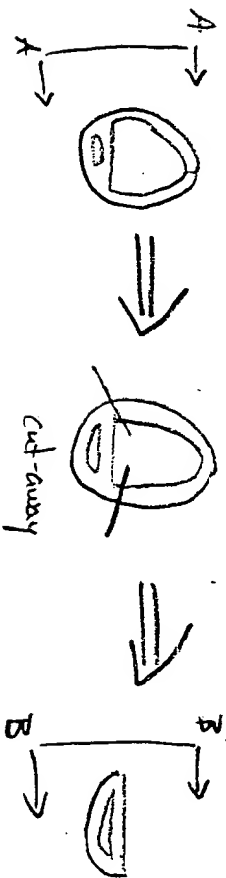
Material: Platinum
PTFE



Purpose: Visualization on Fluoro, and allows for a predictable exit point



WINDOW: - right now is a cut-away leaving a lumen that looks like

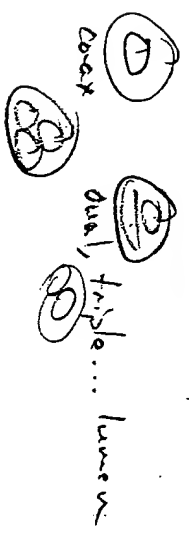
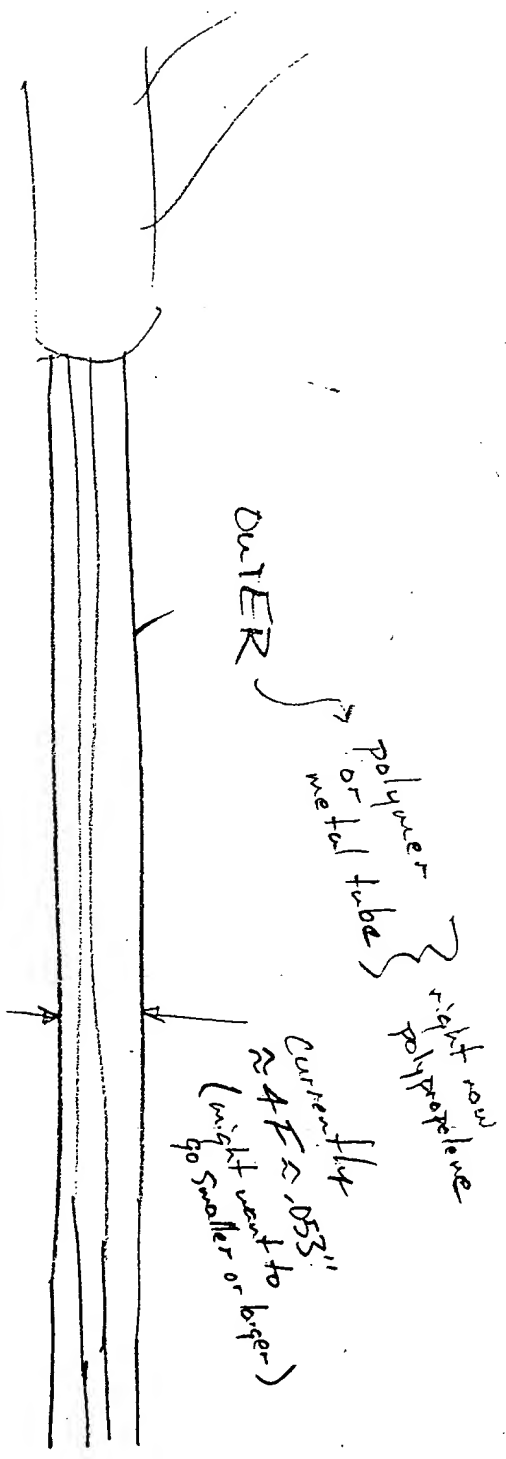


- optimal length for the window is 3mm long (currently)
- optimal window location would be determined by the use of the device (ie. in coronary would like to be w/in 20mm of distal tip, in peripheral --- ???)

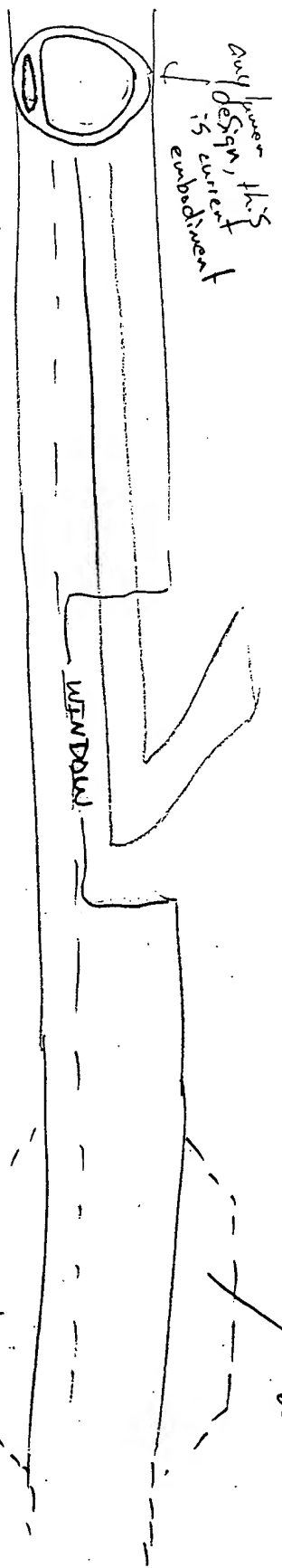
Puncture device / drug delivery tube:

- size ranges (from 0.0005 in up to 0.050")
- materials noted on other page

due
7/2/92



- lumen for drug delivery
- lumen for guide wire
- could be a 3rd for a balloon...



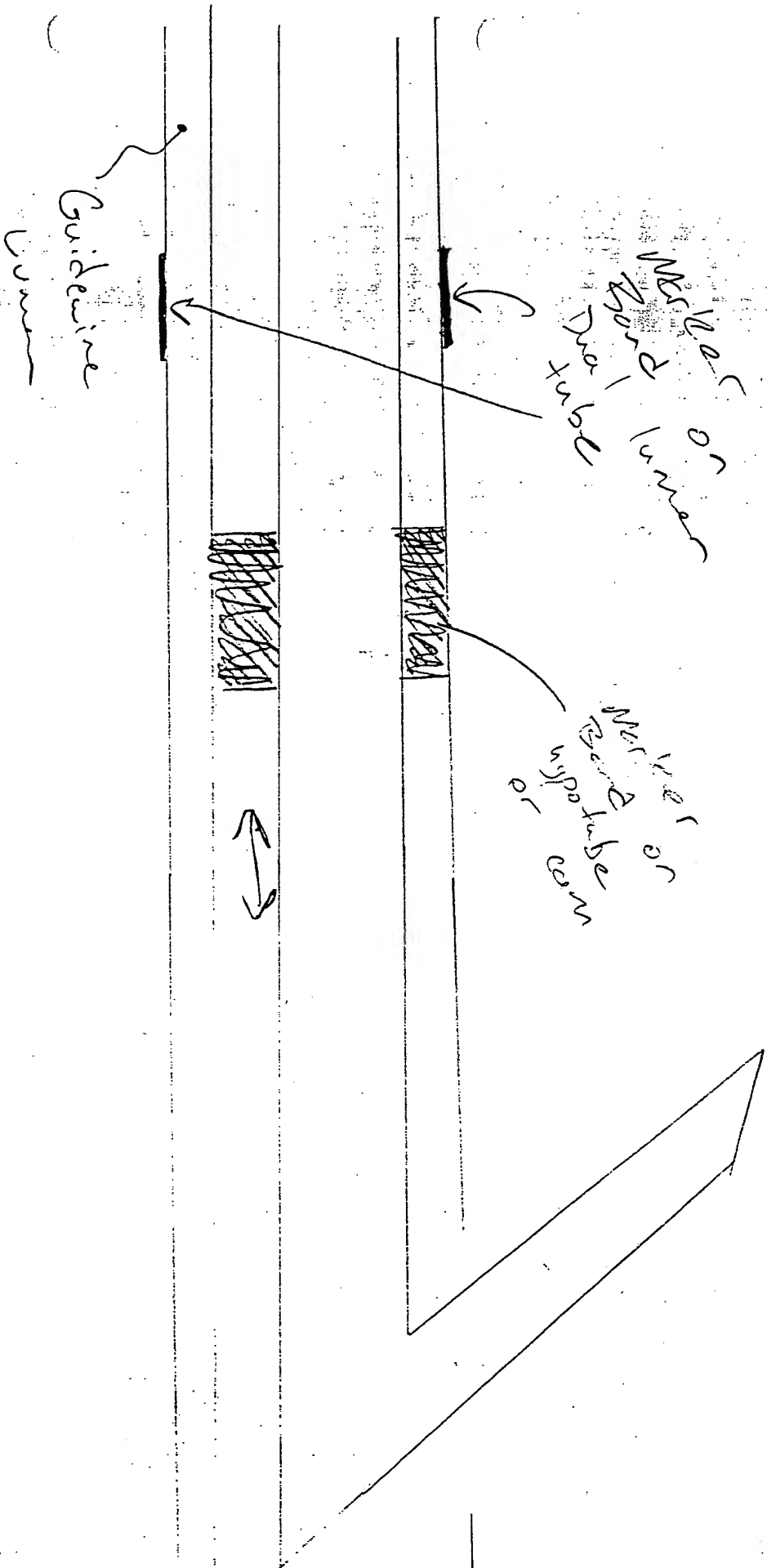
- drug delivery tube goes in one of these lumens (free longitudinal motion)
- could be made of
 - polyimide tubing,
 - nitinol
 - polycarbonate

if there is a balloon, could be concentric, eccentric + woul

- Manifold for this device is the same as that which was used for the temp stent device.
(See prints # 03111-05, 06)
 - It is important to note that the hypotube requires free longitudinal motion within it's lumen.
 - Different models of this device would be sold w/ different lengths of needle (L) external to catheter.
 - ID's + OD's of all of these tubes could be coated w/ teflon, HPC, extra coating.
 - Adhesives :
 - epoxy
 - cyanoacrylates
 - urethanes
- Gus... take a look at other SciMed applications for commonly used adhesives.

BT

Opening Gauge



Purpose: Indication of the degree to which the needle has opened and penetrated

Polymers for controlled release

Hydrogels

Poly lactic acid

Poly glycolic acid

Poly ortho esters

Poly caprolactone

Cross-linked proteins

cross linked carbohydrates

Alginic Acid

Gelatin

copolymers of the above and below

Poly methyl methacrylate

Agar

Agarose

Gus: here's a start

SCIMED®

FAX TRANSMISSION

APR 22 2002

DATE: 7/2/97

ATTENTION: Gustava Siller

COMPANY: William, Brinks, Olds et. al.

FAX NUMBER: 312-321-4299

SUBJECT: _____

NUMBER OF PAGES (INCLUDING THIS ONE): 9

FROM: Boad Linden

DIRECT PHONE NO.: 420-0564

SCIMED Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, MN 55369

Switchboard# 612-420-0700
Direct FAX - Ops: 612-420-0747

NOTES/INSTRUCTIONS:

July 2, 1992

Gustavo Siller, Esq.
William Brinks Olds Hofer
Gilson & Lione
NBC Tower
455 North Cityfront Plaza Drive
Suite 3600
Chicago, IL 60611-5599

Re: Drug Delivery Concept

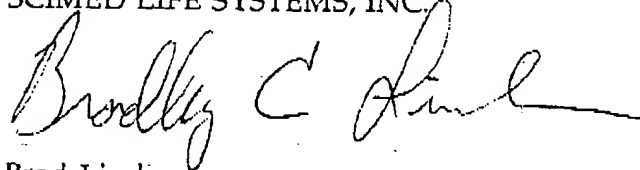
Dear Gus:

Enclosed is the additional disclosure that you requested on the drug delivery concept that you are working on. I am hoping that this will give you what you are looking for.

If you need any more information, or any clarification on the drawings that I am sending you, please feel free to call. I can be reached at (612) 420-0564. Thanks for all of your help in this matter.

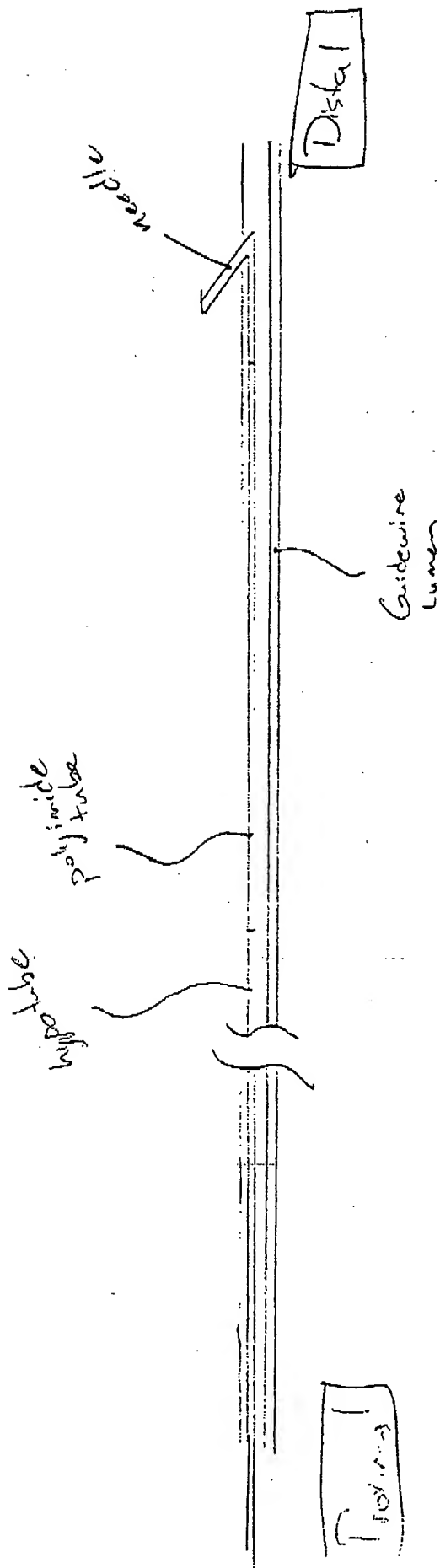
Sincerely,

SCIMED LIFE SYSTEMS, INC.



Brad Linden
Biochemist

Multiple communicating
hypotube materials



DLF
4/1/91

BL-

Distal tip

Beveled needle point
(angulation of needle point can be varied for different cutting effects)

large lumen
0.227 inches
0.227 inches

window

angulation can be changed for different cutting effects

polyimide tubing

Distal

Guidewire lumen
currently accepts .014" wire

stainless steel
hypotube

Proximal

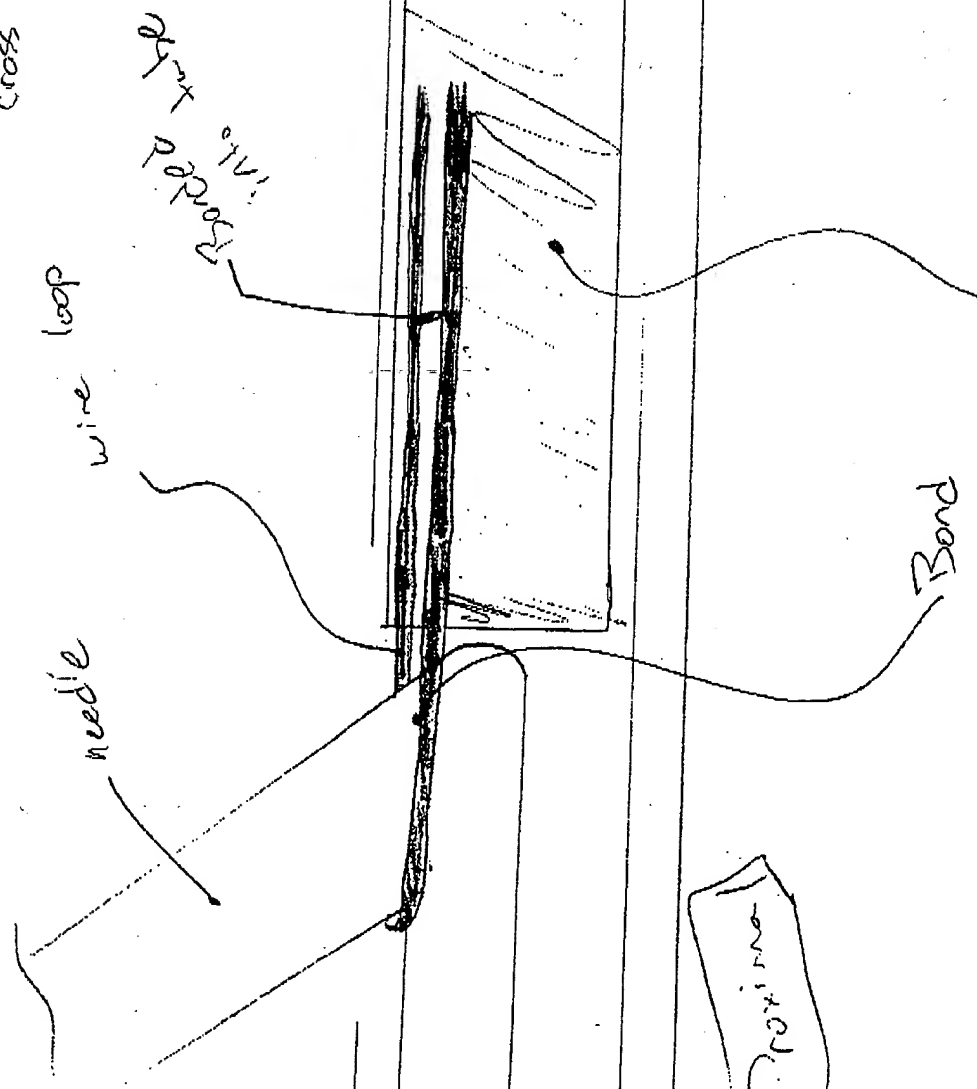


Dual Lumen
Cross Section

BL
rule 7/2/92

Tracing Trolley

cross section of trolley can be:



Tubing filled with adhesive

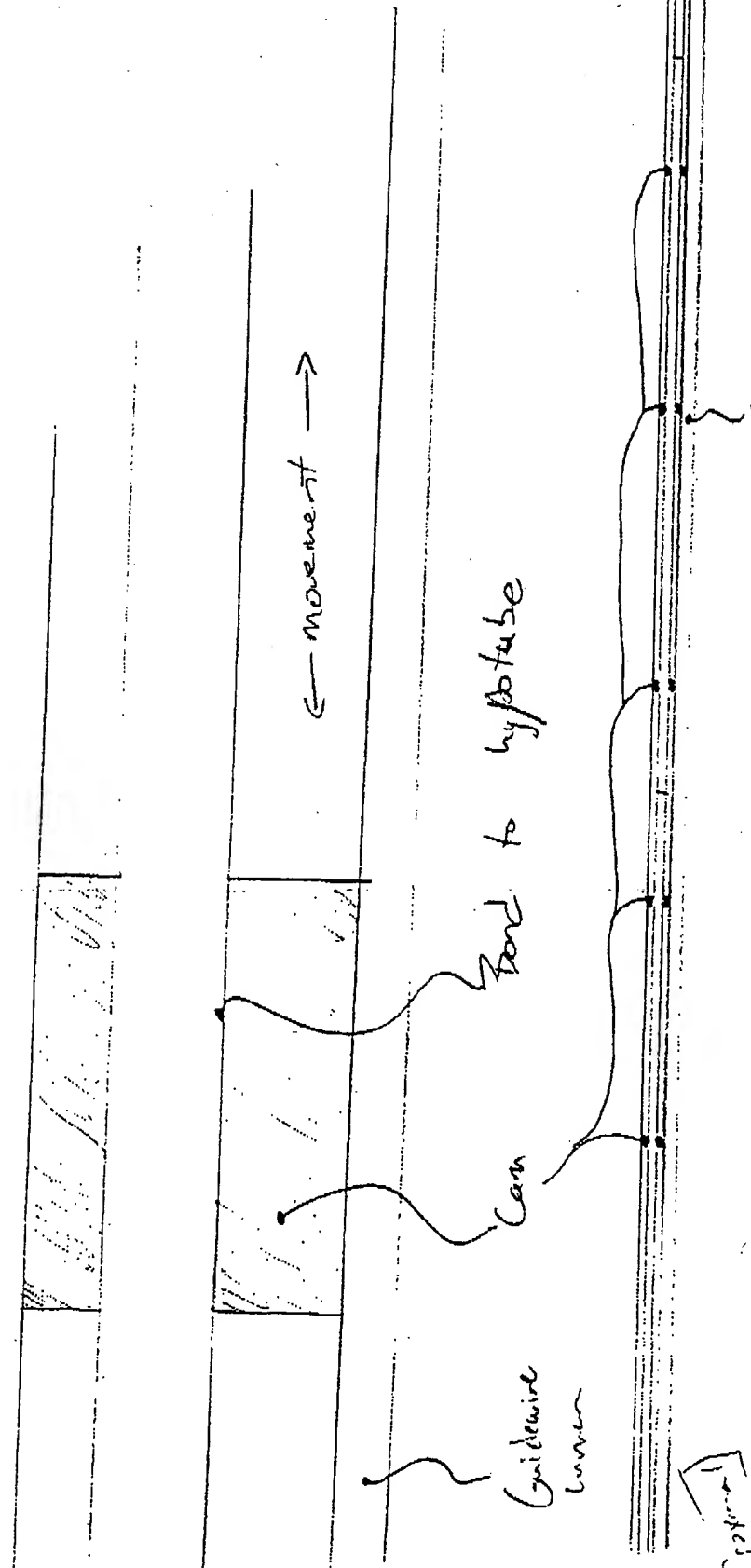
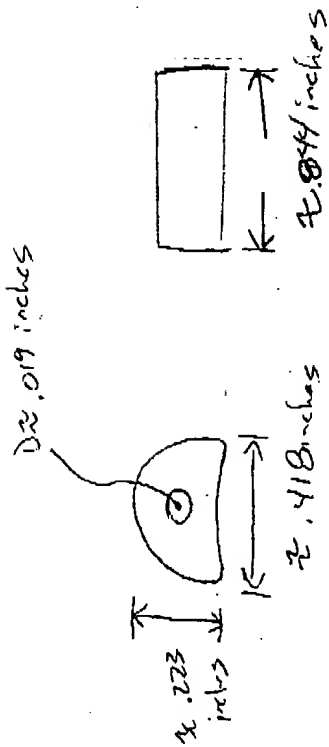
Purpose: Trolley guides the hypotube is advanced forward

back into window when the

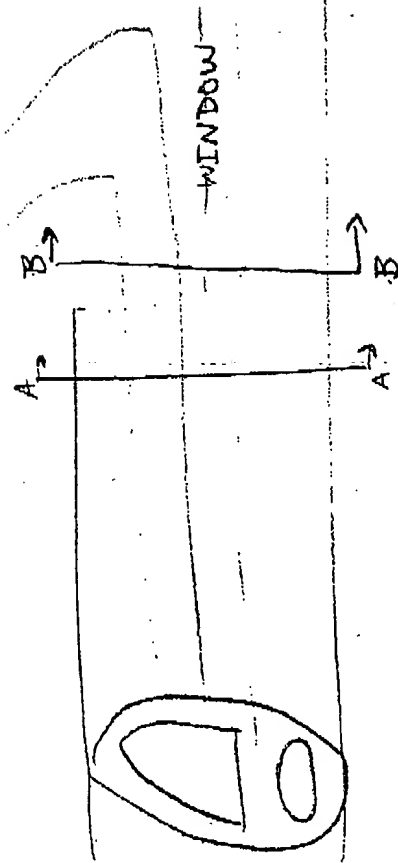
BC, due to the

Anti-Rotation Cams

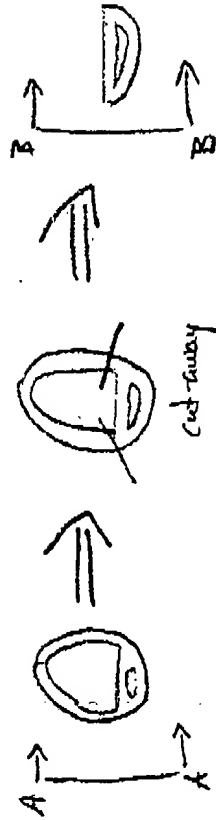
Material: Platinum
PTFE



Purpose: Visualization on Fluoro, and allows for a predictable exit point from the catheter for the needle.



WINDOW: - right now is a cut-away leaving a lumen that looks like



- optimal length for the window is 3mm long (currently)
- optimal window location would be determined by the use of the device (i.e. in coronary, would like to be w/in 20mm of distal tip, in peripheral... ???)

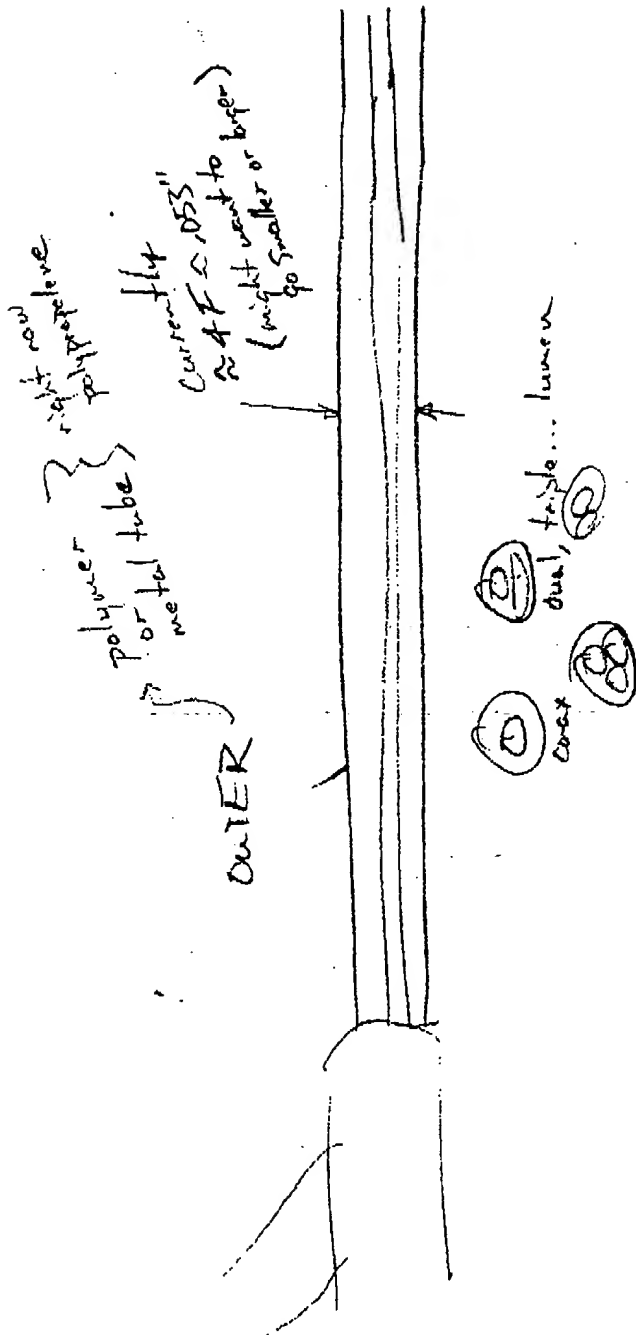
Puncture device / long delivery tube:

- size ranges (from 0.0005 on up to 0.050")
- materials noted on other page

DOE
7/2/92

due
7/2/92

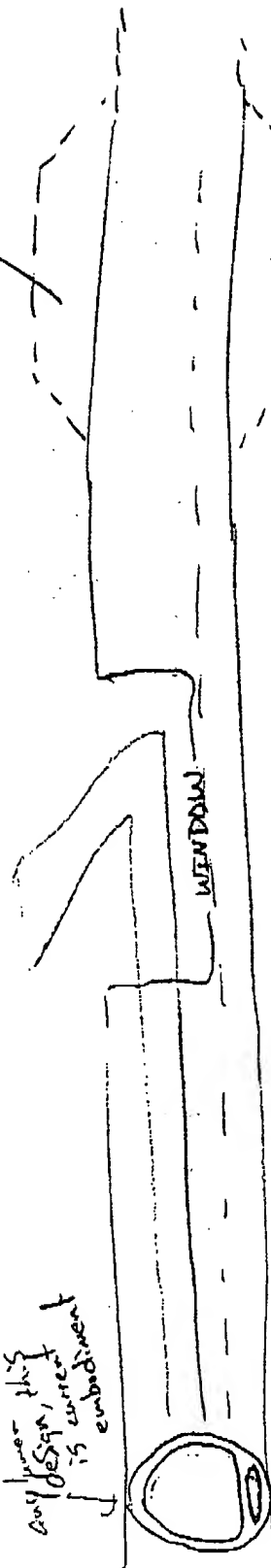
HA



- lumen for drug delivery
- lumen for guide wire
- could be a 3rd for a balloon...

possible
balloon

any lumen this
design, if
is current
embedment



→ drug delivery tube goes in one of these lumens (free longitudinal motion)

- could be made of
 - polyimide tubing
 - stainless steel hypotube
 - P, n, all vlcus
- nitinol
- Polycarbonate
- Or any combination of a polymer/metal

if there is
a balloon could
be concentric,
eccentric + would
probably require a
third lumen

2474
30A

JF

Gus... take a look at other Sealed applications for commonly used adhesives.

- Adhesives : - epoxy
- cyanoacrylates
- urethanes

- ID's + OD's on all of these tubes could be coated w/ teflon, HPC, extra coating.

- Different models of this device would be sold w/ different lengths of needle (L) external to catheter.

- It is important to note that the hypodermic requires free longitudinal motion within it's lumen.

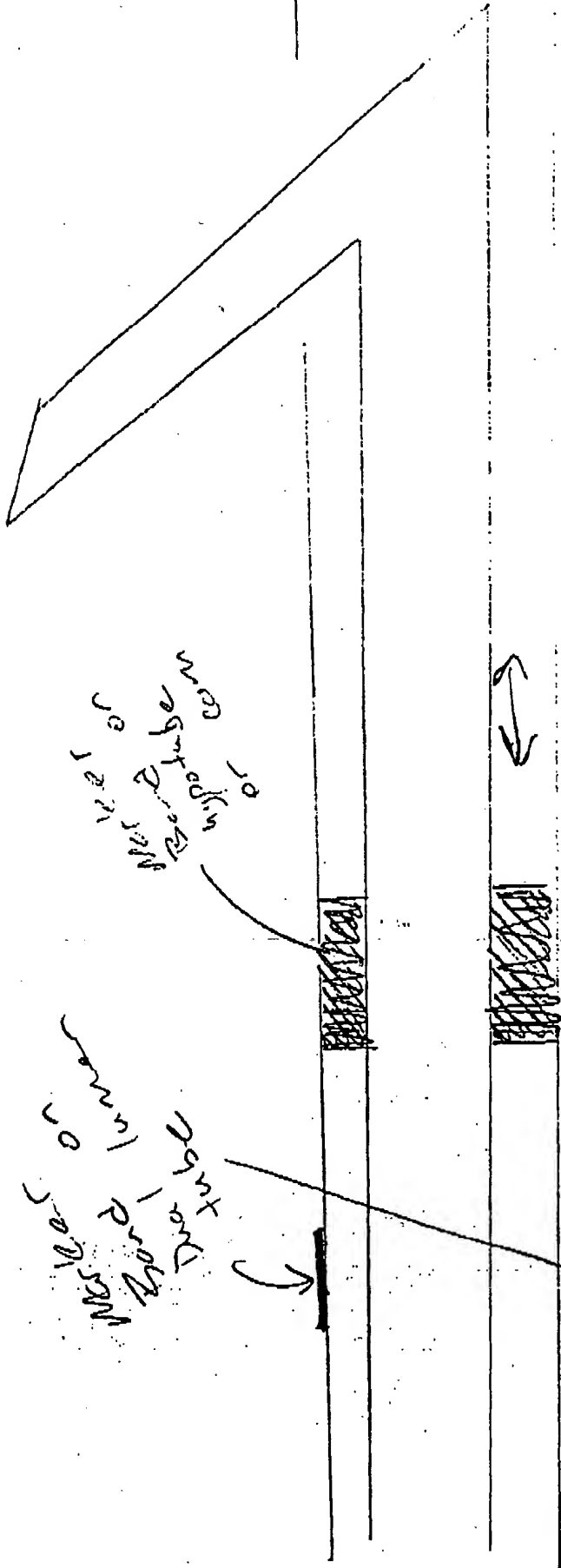
(See prints # 03111-05,06)

- Maulfold for this device is the same as that which was used for the pump start device.

clean pencil

not or
not or
not or

not or
not or
not or



Guidewire
needle

Purpose: Indication of the degree to which the needle has opened a D penetrated

36
DUE 4/2/92

Polymers for controlled release

Hydrogels

Poly lactic acid

Poly glycolic acid

Poly ortho esters

Poly caprolactone

cross-linked proteins

cross linked carbohydrates

Alginic Acid

Gelatin

copolymers of the above and below

Poly methyl methacrylate

Agar

Agarose

Gus: here's a start



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

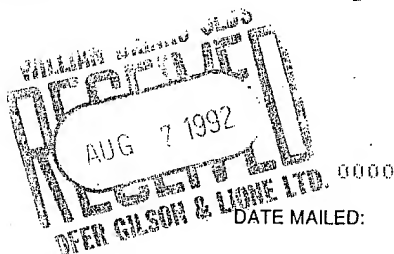
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER FILING DATE FIRST NAMED APPLICANT ATTY DOCKET NO./TITLE

07/913,227 07/14/92 LINDEN

B 3570113

GUSTAVO SILLER, JR.
WILLIAM BRINKS OLDS
HOFFER GILSON & LIONE LTD.
P.O. BOX 10395
CHICAGO, IL 60610



216

08/04/92

NOTICE TO FILE MISSING PARTS OF APPLICATION
FILING DATE GRANTED

APR 22 2002

A filing date has been granted to this application. However, the following parts are missing.

If all missing parts are filed within the period set below, the total amount owed by applicant as a

☒ large entity, ☐ small entity (verified statement filed), is \$ 130.00

1. ☐ The statutory basic filing fee is: ☐ missing ☐ insufficient. Applicant as a ☐ large entity ☐ small entity, must submit \$ _____ to complete the basic filing fee and MUST ALSO SUBMIT THE SURCHARGE AS INDICATED BELOW.
2. ☐ Additional claim fees of \$ _____ as a ☐ large entity ☐ small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due. NO SURCHARGE IS REQUIRED FOR THIS ITEM.
3. ☒ The oath or declaration:
☐ is missing.
☐ does not cover items omitted at time of execution.

An oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date is required. A SURCHARGE MUST ALSO BE SUBMITTED AS INDICATED BELOW.
4. ☐ The oath or declaration does not identify the application to which it applies. An oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date is required. A SURCHARGE MUST ALSO BE SUBMITTED AS INDICATED BELOW.
5. ☐ The signature to the oath or declaration is: ☐ missing; ☐ a reproduction; ☐ by a person other than the inventor or a person qualified under 37 CFR 1.42, 1.43, or 1.47. A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date is required. A SURCHARGE MUST ALSO BE SUBMITTED AS INDICATED BELOW.
6. ☐ The signature of the following joint inventor(s) is missing from the oath or declaration:

_____. An oath or declaration listing the names of all inventors and signed by the omitted inventor(s), identifying this application by the above Application Number and Receipt Date is required. A SURCHARGE MUST ALSO BE SUBMITTED AS INDICATED BELOW.
7. ☐ The application was filed in a language other than English. Applicant must file a verified English translation of the application and a fee of \$30.00 under 37 CFR 1.17(k), unless this fee has already been paid. NO SURCHARGE IS REQUIRED FOR THIS ITEM.
8. ☐ A \$50.00 processing fee is required for returned checks. (37 CFR 1.21(m)).
9. ☐ Your filing receipt was mailed in error because check was returned without payment.
10. ☐ Other.

An Application Number and Filing Date have been assigned to this application. The missing parts and fees identified above in items 1 and 3-6 must be timely provided ALONG WITH THE PAYMENT OF A SURCHARGE of \$120.00 for large entities or \$60.00 for small entities who have filed a verified statement claiming such status. The surcharge is set forth in 37 CFR 1.16(e). Applicant is given ONE MONTH FROM THE DATE OF THIS LETTER, OR TWO MONTHS FROM THE FILING DATE of this application, WHICHEVER IS LATER, within which to file all missing parts and pay any fees required above to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

Direct the response to, and any questions about, this notice to ATTENTION: Application Division, Special Handling Unit.

A copy of this notice MUST be returned with response.

M. Middleton
For: Manager, Application Division
(703) 557-308-1209

APR 22 2002

Serial No.: 07/913,227
Filing Date: July 14, 1992

Case No. 3570/216

ASSIGNMENT

WHEREAS, Bradley C. Linden and Donald F. Palme II, hereinafter called the "Assignors", have jointly invented a new and useful INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD, for a full description of which reference is made in U.S. Patent Application Serial No. 07/913,227, filed July 14, 1992; and

WHEREAS, SciMed Life Systems, Inc., a corporation organized and existing under the laws of the State of Minnesota, having a place of business in the City of Maple Grove, State of Minnesota, hereinafter called the "Assignee", is desirous of acquiring the entire right, title and interest in and to said invention, the application above identified, and in, to and under Letters Patent which may be obtained for said invention, as hereinafter more fully set forth;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, be it known that for and in consideration of the sum of One Dollar (\$1.00), and other valuable and legally sufficient considerations, the receipt of which by the Assignors from the Assignee is hereby acknowledged, the Assignors have sold, assigned and transferred, and by these presents do sell, assign and transfer unto the Assignee, the entire right, title and interest for the United States in and to the invention and application hereinabove identified, and any Letters Patent of the United States that may issue for said invention, together with the entire right, title and interest in and to said invention and application for Letters Patent and Letters Patent therefor, in all countries foreign to the United States, including the full right to claim for any such application all benefits and priority rights under any applicable convention; to have and to hold for the sole and exclusive use and benefit of the Assignee, its successors and assigns, to the full end of the term or terms for which any and all of said Letters Patent for said invention may issue.

And the Assignors do hereby covenant and agree, for themselves and their legal representatives, that they will assist their Assignee in the prosecution of the application herein identified; in the making and prosecution of any other applications for Letters Patent that the Assignee may elect to make covering the invention herein identified, as hereinbefore set forth; in vesting in the Assignee like exclusive title in and to all such other applications and Letters Patent; and in the prosecution of any interference which may arise involving said invention, or any application or Letters Patent herein contemplated; and that they will execute and deliver to the Assignee any and all additional papers which may be requested by the Assignee to fully carry out the terms of this Assignment.

And the Commissioner of Patents and Trademarks is hereby authorized and requested to issue Letters Patent to the Assignee in accordance with the terms of this Assignment.

IN TESTIMONY WHEREOF, the Assignors have hereunto set their hands and affixed their seals.

DATE:

August 5, 1992

Bradley C. Linden (SEAL)
Bradley C. Linden

DATE:

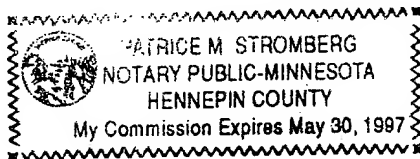
August 6, 1992

Donald F. Palme II (SEAL)
Donald F. Palme II

STATE OF MINNESOTA)
) ss.
COUNTY OF Hennepin)

I, Patrice M. Stromberg, a Notary Public in and for the County and State aforesaid, do hereby certify that Bradley C. Linden, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that he signed, sealed and delivered the said instrument as his free and voluntary act for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and Notarial Seal, this 5th day of August, 1992.



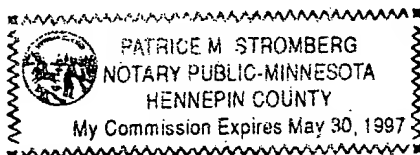
Patrice M. Stromberg
Notary Public

My Commission Expires: 5-30-97

STATE OF Minnesota)
) ss.
COUNTY OF Hennepin)

I, Patrice M. Stromberg, a Notary Public in and for the County and State aforesaid, do hereby certify that Donald F. Palme II, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that he signed, sealed and delivered the said instrument as his free and voluntary act for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and Notarial Seal, this 6th day of August, 1992.



Patrice M. Stromberg
Notary Public

My Commission Expires: 5-30-97

WESTMAN, CHAMPLIN & KELLY

A PROFESSIONAL ASSOCIATION

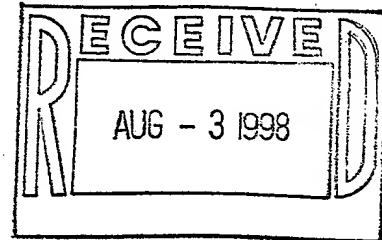
SUITE 1600 - INTERNATIONAL CENTRE
900 SECOND AVENUE SOUTH
MINNEAPOLIS, MINNESOTA 55402-3319

NICKOLAS E. WESTMAN
JUDSON K. CHAMPLIN
JOSEPH R. KELLY
STEVEN M. KOEHLER
DAVID D. BRUSH
JOHN D. VELDHUIS-KROEZE
DEIRDRE MEGLEY KVALE
THEODORE M. MAGEE
PETER S. DARDI
ROBERT E. ATKINSON

APR 22 2002

PATENT, TRADEMARK, COPYRIGHT
LAW AND RELATED ISSUES
(612) 334-3222 TELEPHONE
(612) 334-3312 FACSIMILE

August 3, 1998



Luke Dohmen, Esq.
SCIMED Life Systems, inc.
Mail Station A150
One SCIMED Place
Maple Grove, MN 55311-1566

Re: U.S. Reissue Patent Application
Applicant : Bradley C. Linden et al.
Patent No.: 5,538,504
Issued : July 23, 1996
For : INTRA-EXTRAVASCULAR DRUG DELIVERY
CATHETER AND METHOD
Our File : S13.12-0036
Your File : SM-P0080-US03

Dear Luke:

Please find enclosed your files SM-P0080-US01 and SM-P0080-US02. We have obtained a copy of the prosecution history of the Linden '504 from the Patent Office. If you would like a copy of this file wrapper, please do not hesitate to call. Thank you for letting me be of service to you in this matter.

Sincerely,

Robert E. Atkinson

REA:smn
Enc.

MERCHANT & GOULD

Merchant, Gould, Smith, 3100 Norwest Center
Edell, Welter & Schmidt 90 South Seventh Street
Professional Association Minneapolis, Minnesota
Patent, Trademark & 55402-4131 U.S.A.
Copyright Lawyers FAX 612/332-9081
Direct Dial: 612/336-4655 PHONE 612/332-5300

John D. Gould
Robert T. Edell
Paul A. Welter
Cecil C. Schmidt
John S. Sumners
Alan G. Carlson
Earl D. Reiland
Charles E. Golla
Douglas J. Williams
Albert L. Underhill
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Mark J. DiPietro
Timothy R. Conrad
Alan W. Kowalchuk
Daniel W. McDonald
Randall A. Hillson
John P. Sumrier
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Steven C. Bruess
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J. Derek Vandenburg

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Katherine M. Kowalchuk
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Julie R. Daulton

Scott W. Johnston
MarySusan H. Gabilan
Tyler L. Nasiedlak
Daniel M. Pauly
Daniel J. Mertes
John W. Albrecht
Robert J. Glance
Melissa J. Pytel
Albert F. Davis
Gregory J. Feulner
Myra H. McCormack
Steven R. Funk

Patent Agents
Thomas A. Hassing
Shawn B. Dempster
Min (Amy) Xu
Mark T. Skoog
Iain A. McIntyre

May 28, 1997

APR 22 2002

Robert E. Atkinson
Senior Patent Agent
SCIMED LIFE SYSTEMS, INC.
Mail Stop A150
One SciMed Place
Maple Grove, MN 55311-1566

Re: 1249.0-00-06

Dear Mr. Atkinson:

Enclosed we are returning the two SciMed files, SM-P0080-US01 and SM-P0080-US02, provided to Bob Beck.

Yours very truly,

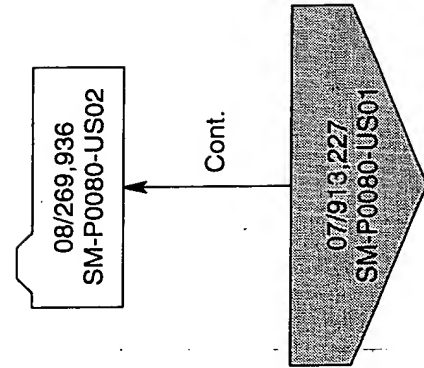


Judy Tess
Secretary to Robert C. Beck

Enclosures

Wednesday, May 17, 1995

SM-P0080...
Intra-Extravascular Drug Delivery Catheter And Method
Luke
Cardio-NM
Linden, Palme, Keith, Atkinson
WB



PARENT FILED 7/14/92

WILLIAN BRINKS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE
SUITE 3600

CHICAGO, ILLINOIS 60611-5599

TELEPHONE 312 321-4200

CABLE JUDICATURE CHICAGO

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FACSIMILE 312 321-4299

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WASHINGTON, D.C. 20006-1809
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TELEX 650 383-5605
FACSIMILE 202 293-1850

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TELEX 140994
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TELEPHONE 419 244-6578
TELEX 140342
FACSIMILE 419 244-8862

KARL A. VICK
(312) 321-4247

April 10, 1994

Luke

Peter J. Gafner, Esq.

SciMed Life Systems, Inc.

One SciMed Place

Maple Grove, Minnesota 55311-1566

APR 22 2002

Re: U.S. Application Serial No. 07/913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our file No. 3570/216 *86-4561*

Dear Peter:

The above-identified application was formally allowed
as of April 1, 1994.

Enclosed is a copy of the Examiner's Amendment. I
agreed to this Amendment during a phone conference with Examiner
Maglione. The changes mainly clarify the claim language. Please
review the amendment and let me know if you have any comments.

An issue fee of \$1,170 for the 29 allowed claims is due
to be paid within three months after the date of allowance.
Unless we hear from you to the contrary, we will arrange to pay
this fee toward the end of the three-month period.

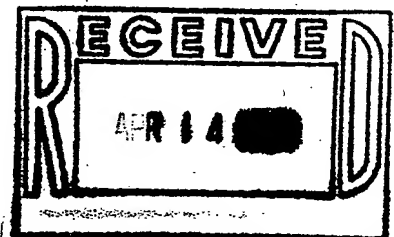
We will write to you again when the Patent and
Trademark office notifies us of the patent number and issue date
assigned to the application.

Sincerely,

Karl

Karl A. Vick

KAV/law
Enclosure



WILLIAN BRINKS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

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TELEPHONE 419 244-6578
TELEX 140342
FACSIMILE 419 244-8862

KARL A. VICK
(312) 321-4247

November 19, 1993

07/913,227

Mr. Donald F. Palme II
SciMed Life Systems, Inc.
6655 2Wedgwood Road
Maple Grove, Minnesota 55311-3648

APR 22 2002

Re: U.S. Application Serial No. 913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our File No. 3570/216

Dear Don:

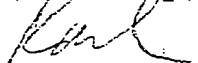
We have recently received an Office Action in connection with the above-identified application. A copy of the Office Action is enclosed, along with a copy of the newly cited reference.

Please review the cited references and the Examiner's art-based rejections, and then call me to discuss your comments.

A response is due by January 26, 1994, and three one-month extensions are available upon payment of the required extension fees. Therefore, the absolute latest date to respond is April 26, 1994.

I look forward to hearing from you.

Sincerely,



Karl A. Vick

KAV/law
Enclosure

cc. Mr. Dave VandenEinde (with enclosure)
Ms. Patrice Stromberg (w/o enclosure)
Ms. Jeannine Bowen (w/o enclosure)

SCIMED®

07/9/3,227

July 20, 1993

Karl Vick, Esq.
Willian, Brinks, Olds, Hofer, Gilson & Lióne
NBC Tower
455 North Cityfront Plaza Drive
Suite 3600
Chicago, IL 60611-5599

re: 3570/216 Intra-Extra Vascular Drug Delivery Catheter and Method

Dear Karl:

This letter is to inform you that SCIMED will not be pursuing foreign protection in the above referenced file, at this time.

If you have any questions, please feel free to give me a call.

Sincerely,

SCIMED LIFE SYSTEMS, INC.



David A. VandenEinde
Patent Engineer

DVE/md

cc: Corresponding SCIMED file

WILLIAM BRINKS OLDS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE
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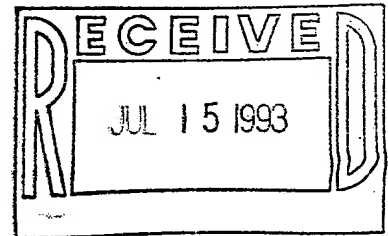
ARLINGTON, VA. OFFICE
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FACSIMILE 317 634-6701

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KARL A. VICK
(312) 321-4247

July 13, 1993



Mr. David A. VandenEinde
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, Minnesota 55311-3648

APR 22 2002

Re: U.S. Application Serial No. 07/913,227
"Intra-Extravascular Drug Delivery
Catheter and Method"
Our File No. 3570/216

Dear Dave:

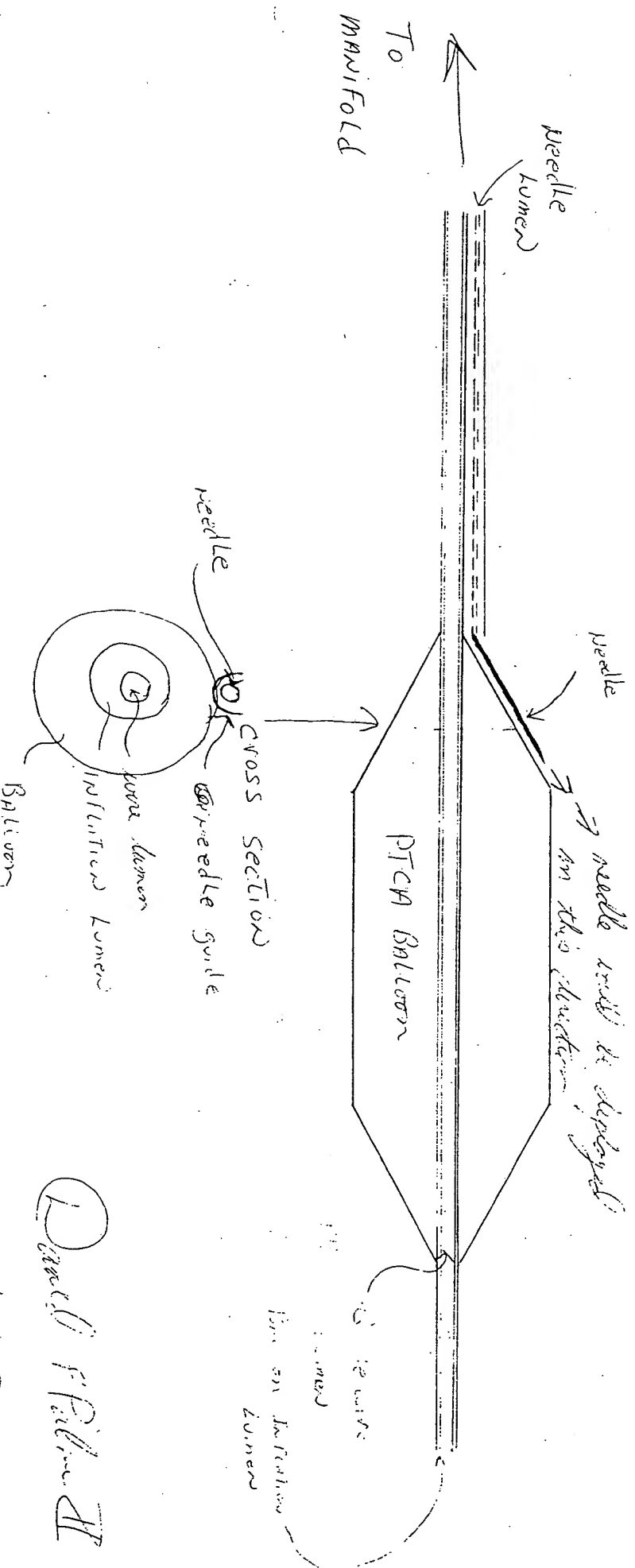
Enclosed is a copy of a sketch I received from Don
Palme. The sketch discloses an additional embodiment of the
"Intra-extravascular Drug Delivery Catheter and Method" invention
referenced above.

Please let me know whether you would like us to file a
continuation-in-part application covering this embodiment.

Sincerely,


Karl A. Vick

KAV/law
Enclosure



David F. Fildes II

3/10/03

Memo to File

Date: May 28, 1993

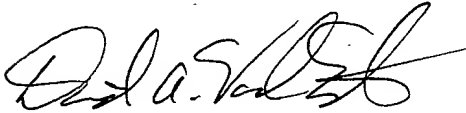
File: 3570/216 (US Serial # 07/913,227)

Subject: Foreign Filing Decision

APR 22 2002

On May 28, 1993 I communicated (per John Rissman's request) to Gus Siller of Willian, Brinks, Olds, et al., in response to our pending foreign filing decision in the above mentioned case, that SCIMED will not be pursuing foreign protection at this time.

File 3570/216 (US Serial # 07/913,227) is titled "Intra-Extra Vascular Device for Drug Delivery".



David A. VandenEinde

WILLIAN BRINKS OLDS HOFER GILSON & LIONE

A PROFESSIONAL CORPORATION

NBC TOWER

455 NORTH CITYFRONT PLAZA DRIVE

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CHICAGO, ILLINOIS 60611-5599

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CABLE JUDICATURE CHICAGO

TELEX 254300

FACSIMILE 312 321-4299

March 16, 1993

WASHINGTON OFFICE
2000 K STREET, N.W.
SUITE 200

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FACSIMILE 202 293-1850

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TELEPHONE 419 244-6578
TELEX 140342
FACSIMILE 419 244-8862

KARL A. VICK

(312) 321-4247

Mr. Donald F. Palme II
SciMedLife Systems, Inc.
6655 Wedgwood Road
Maple Grove, Minnesota 55311-3648

Re: Our Case No. 3570/216 - Linden et al.
U.S. Application Serial No. 07/913,227
INTRA-EXTRAVASCULAR DRUG DELIVERY
CATHETER AND METHOD

Dear Don:

We have received a first Office Action from the Patent and Trademark Office concerning the above-identified application. Enclosed is a copy of the Office Action, along with the patents cited therein.

In summary, the Office Action advises us of certain conclusions reached by the Examiner concerning the application, and that our response to this communication should be filed by April 11, 1993. Three one month extensions are available upon payment of the required extension fees. Thus, the absolute latest date to respond is July 11, 1993.

As you will see from subsequent pages of the Office Action, the Examiner objects to the application for various formal reasons, and rejects certain of the claims based on certain of the enclosed patents. This is all quite normal.

Please review the patents cited by the Examiner, paying particular attention to Hawkins et al., Sewell, Jr. and Boque et al., then outline for us the ways in which these patented structures fail to disclose or teach the invention disclosed in your application.

7

Mr. Donald F. Palme II
March 16, 1993
Page 2

With this information we should be able to prepare a response to the Examiner.

Please call me if you have any questions.

Sincerely,

A handwritten signature in cursive script, appearing to read "Karl".

Karl A. Vick

KAV/sk
Enclosures

[54] DOUBLE LUMEN CATHETERS

[75] Inventors: Beuford A. Bogue, Littleton, Colo.;
Stephan A. Gagneux, Muttentz,
Switzerland

[73] Assignee: Hospal Medical Corp., Littleton,
Colo.

[21] Appl. No.: 86,043

[22] Filed: Oct. 18, 1979

[51] Int. Cl. A61M 5/14

[52] U.S. Cl. 128/214.4; 128/221;
128/347

[58] Field of Search 128/214.4, 214.2, 214 R,
128/221, 347, 349, 350, DIG. 16, 240

[56]

References Cited

U.S. PATENT DOCUMENTS

3,572,334	3/1971	Petterson	128/214.4
3,833,003	9/1974	Tarrico	128/347
4,073,297	2/1978	Kopp	128/214.4
4,202,332	5/1980	Tersteege et al.	128/214.4

Primary Examiner—Stephen C. Pellegrino

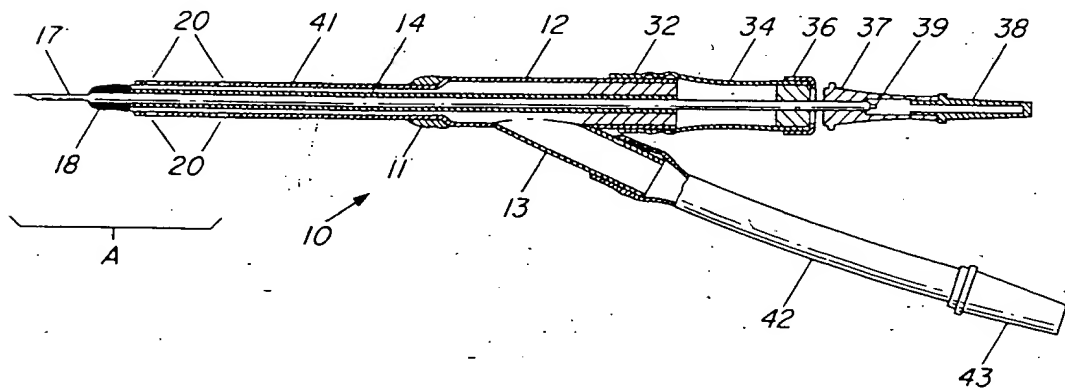
Attorney, Agent, or Firm—Gerald D. Sharkin; Robert S.
Honor; Walter F. Jewell

[57]

ABSTRACT

A double lumen, single needle, catheter is provided having an improved insertion tip which alleviates the trauma induced when inserted in a blood vessel or fistula.

7 Claims, 3 Drawing Figures



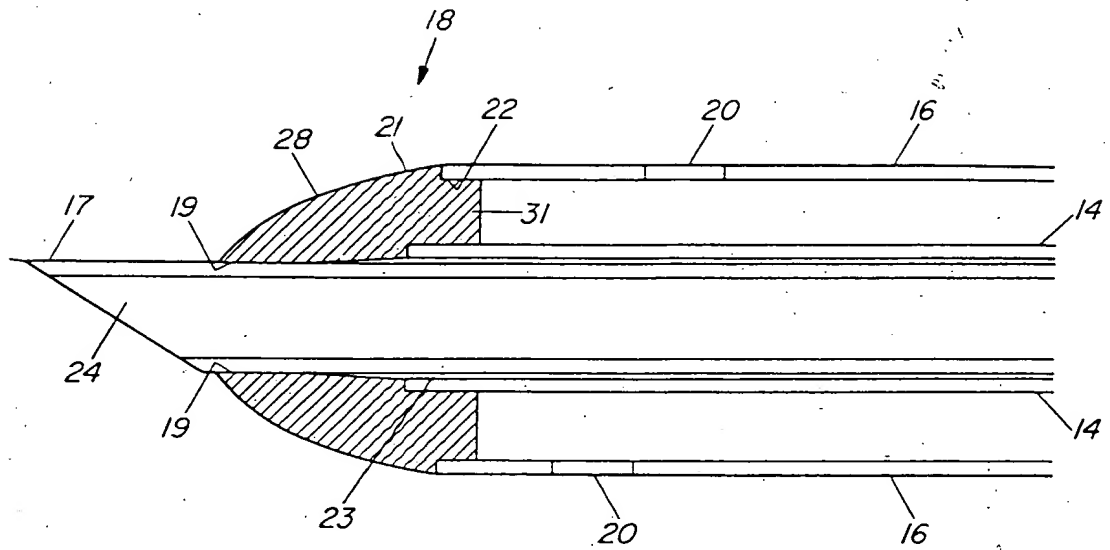


FIG. 2

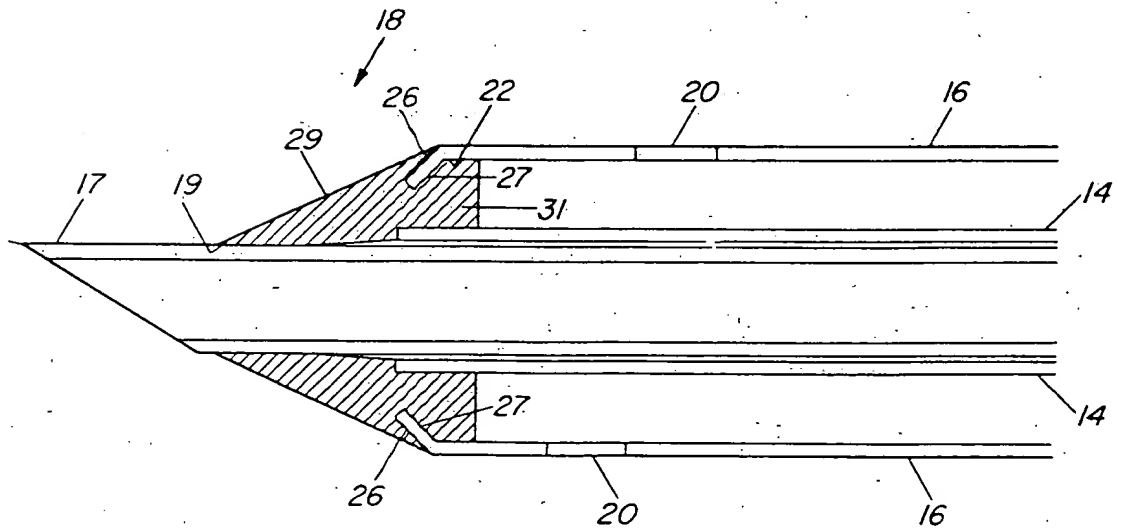


FIG. 3

DOUBLE LUMEN CATHETERS

BACKGROUND OF THE INVENTION

This invention relates to catheters. More particularly, the invention relates to double lumen catheters for placement in an artery, vein or fistula vessel of a patient, through which blood may be withdrawn and delivered simultaneously to and from the patient's blood or body fluid access.

Two important medical problems arise when large blood flows have to be established for relatively long time periods when using catheters. The first is trauma to the blood vessel or fistula due to the catheter insertion. The second is the possibility of additional vessel trauma as a result of movements of the sharp catheter tip lodged within the vessel. This invention provides a double lumen catheter which alleviates the above blood vessel or fistula trauma.

SUMMARY OF THE INVENTION

Broadly, this invention provides an improved double lumen single needle intravenous catheter device having a hub means including first and second spaced apart fluid conduit means, with an inner lumen in fluid communication at its proximal end with the first conduit means and an outer lumen in fluid communication at its proximal end with the second conduit means, the lumens being in concentric relationship to one another. At least one aperture is provided in the wall of the outer lumen at its distal end region.

The improvement comprises a substantially frustoconical tip element of plastics material having a bore defining an extension of the inner lumen and having an annular base section providing an annular seal between the outer surface of the distal end region of the inner lumen and the adjacent interior surface of the distal end region of the outer lumen.

This structure defines an annular passage between the inside surface of the outer lumen and the outside surface of the inner lumen which communicates between the aperture and the second conduit means and which is sealed from the passage provided by the bore of the tip element and the inner lumen which communicates with the first conduit means. The substantially frustoconical surface of the tip element provides for ease of entry of the catheter into a blood vessel or fistula.

In one aspect of the invention, the distal end of the outer lumen may be recessed in the peripheral surface of the base portion of the tip.

In a preferred embodiment of the catheter of this invention, the distal end of the outer lumen has an annular inwardly directed flange which mates with a corresponding recess in the base portion of the tip to secure the tip in fluid-tight relationship with the inner and outer lumens.

The distal end region of the inner lumen may be fitted into a recess in the bore of the tip so as to provide a substantially continuous smooth fluid passage from the interior of the inner lumen to the opening defined by the bore at the end of the tapered portion of the tip. The distal ends of the inner and outer lumens may be in substantial alignment.

The catheter of this invention may have a removable trocar located in the inner lumen such that the point of the trocar protrudes through the opening defined by the distal end of the inner lumen and beyond the tapered portion of the tip. The first conduit means may have a

flexible tube coaxially connected to its free end and a removable resealable plug sealing closed the free end of the flexible tube.

The tip of the catheter of this invention may be prepared from plastic material. Preferably the plastic should have a low coefficient of surface friction to allow for ease of insertion of the catheter following penetration of the blood vessel or fistula of a patient by the trocar. Preferred plastic materials are polyethylene, silicone, polyvinylchloride, teflon, e.g., polytetrafluoroethylene and the like. Teflon and polyethylene are the most preferred.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional side elevation of a catheter assembly having inner and outer lumens in concentric relationship to one another and a removable trocar passing through the inner lumen.

FIG. 2 is a cross-sectional side elevation of the area A of the catheter of FIG. 1 showing a catheter tip of this invention.

FIG. 3 is a cross-sectional side elevation of a preferred catheter tip of this invention.

DETAILED DESCRIPTION

Referring to FIG. 1, reference numeral 10 refers generally to a prior art double lumen catheter assembly having a hub 11 connected to a first conduit 12 and a second conduit 13. An inner lumen 14 is coaxially connected to the first conduit and an outer lumen 16 is coaxially connected to the second conduit. Both the inner and outer lumens are in concentric relationship to one another. A removable trocar 17 is shown disposed within the inner lumen 14.

A plastic tip 18 of this invention (shown in detail in FIG. 2 and FIG. 3) has a bore 19 disposed about the inner lumen 14 in a fluid tight relationship. Opposed apertures 20 are provided in the wall of the outer lumen 16 in the distal end region proximal to the tip 18. The peripheral surface 21 of the tip is in fluid sealing engagement with the adjacent interior surface 22 of the outer lumen 16. As shown in FIG. 2, the outer lumen 16 is recessed at its distal end region in the peripheral surface 21 of the tip to a depth that corresponds substantially to the thickness of the lumen wall. This provides a substantially uninterrupted surface between the surface (periphery) of the tip 18 and the outer lumen 16 and allows for ease of entry of the catheter 10 into a blood vessel or fistula without undue trauma to the vessel or fistula.

Similarly, the inner lumen 14 is recessed within the bore 19 to a depth equal to the lumen thickness. This provides a substantially continuous level annular fluid (e.g., blood) passage from the interior 23 of the inner lumen 14 to the opening 24 of the bore 19.

Referring to FIG. 3, there is shown a preferred embodiment of the catheter tip 18 of this invention. An annular flange 26 at the distal end of the outer lumen 16 is provided. This flange mates with a corresponding recess 27 in the tip to secure the tip to the catheter. An additional feature set forth in FIG. 2 and FIG. 3 is the tapered shape 28 in FIG. 2 and the conical shape 29 of the tip in FIG. 3. In both FIG. 2 and FIG. 3, the tip has a substantially cylindrical base portion 31 which is in sealing relationship with the inner and outer lumens with the tapered portion 28 and the conical portion 29 extending from the base portion 31.

The catheter 10 may be conventionally provided with a fluid seal 32 having a bore 33 in which the proximal end of the inner lumen 14 is sealingly engaged. The bore 33 and inner lumen 14 are in fluid communication with a flexible tube 34. Tube 34 has a removable plug 36 through which the trocar 17 passes.

A female luer 37 is mounted at the proximal end of the trocar 17 which is kept closed by a removable closure cap 38. The female luer has a bore 39 into which an infusion syringe may be fitted.

In operation, the vein, artery or fistula vessel is punctured by means of the trocar 17 and the catheter is inserted into the vessel to a point near the proximal end region 41. Infusion may be effected through the trocar 17 during this placement. The trocar is then withdrawn, the flexible tube 34 clamped closed, the removable resealable plug 36 removed and the end of the flexible tube 34 connected up to a blood line leading to a monitoring and blood pump device (not shown). Similarly, a short length of flexible tubing 42 connected to the second conduit 13 is clamped closed, a cap 43 removed and connected up to a blood line leading from the monitoring and blood pump device.

What is claimed is:

1. In a double lumen single needle intravenous catheter device having a hub means including first and second spaced apart fluid conduit means, an inner lumen in fluid communication at its proximal end with the first conduit means, an outer lumen in fluid communication at its proximal end with the first conduit means, an outer lumen in fluid communication at its proximal end with the second conduit means the lumens being in concentric relationship to one another, at least one aperture being provided in the wall of the outer lumen at its distal end region, the improvement which comprises a substantially frustoconical tip element of plastics material having a bore defining an extension of the inner lumen and having an annular base section providing an annular seal between the outer surface of the distal end region and the inner lumen and the adjacent interior

surface of the distal end region of the outer lumen, wherein the distal end of the outer lumen has an inwardly directed annular flange which mates with a corresponding recess in the base portion of the tip to secure the tip in fluid tight relationship with the inner and outer lumens, whereby an annular passage is defined between the inside surface of the outer lumen and the outside surface of the inner lumen which communications between the aperture and the second conduit means and which is sealed from the passage provided by the bore of the tip element and the inner lumen which communicates with the first conduit means, and whereby the substantially frustoconical surface of the tip element provides for ease of entry of the catheter into a blood vessel or fistula.

2. The catheter device of claim 1 wherein the distal end region of the inner lumen is recessed in the bore of the tip so as to provide a substantially continuous smooth fluid passage from the interior of the inner lumen to the opening defined by the bore at the end of the tapered portion of the tip.

3. The catheter device of claim 2 wherein the distal ends of the inner and outer lumens are in substantial alignment.

4. The catheter device of claim 2 wherein the plastic tip is polytetrafluoroethylene.

5. The catheter device of claim 3 wherein the plastic tip is polyethylene.

6. The catheter device of claim 1 wherein a removable trocar is located in the inner lumen so that the point of the trocar protrudes through the opening defined by the distal end of the inner lumen and beyond the tapered portion of the tip.

7. The catheter device of claim 1 wherein the first conduit means has a flexible tube coaxially connected to its free end and a removable resealable plug sealing closed the free end of the flexible tube and through which the removable trocar passes.

* * * * *

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NBC TOWER

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1130 EDISON PLAZA
TOLEDO, OHIO 43604-1537
TELEPHONE 419 244-6578
TELEX 140342
FACSIMILE 419 244-8862

January 21, 1993

APR 22 2002

Ms. Patrice M. Stromberg
Legal Assistant
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, Minnesota 55311-3648

Re: Our Case No. 3570/216 - Linden et al.
U.S. Application Serial No. 07/913,227
INTRA-EXTRAVASCULAR DRUG DELIVERY
CATHETER AND METHOD

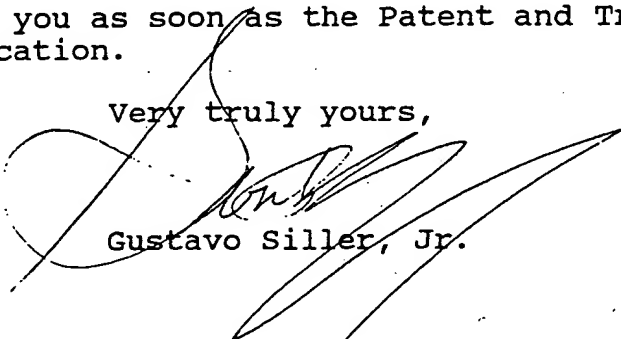
Dear Pat:

Enclosed for your files is the original Assignment conveying title in the above-identified United States patent application to SciMed Life Systems, Inc. This Assignment was recorded in the United States Patent and Trademark Office on August 26, 1992, on Reel 6241, Frames 0428-0431. We suggest that this Assignment be kept with your company's valuable papers.

It will be appreciated if you would sign and return the enclosed copy of the letter acknowledging receipt of the Assignment.

We will advise you as soon as the Patent and Trademark Office acts on the application.

Very truly yours,

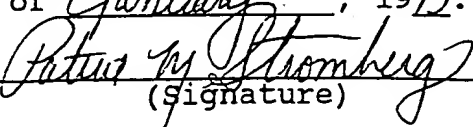

Gustavo Siller, Jr.

GS/nhb

Enclosure

cc: Thomas Hektner

I hereby acknowledge receipt of the above-identified Assignment this 22nd day of January, 1993.


(signature)

WILLIAN BRINKS OLDS HOFER GILSON & LIONE

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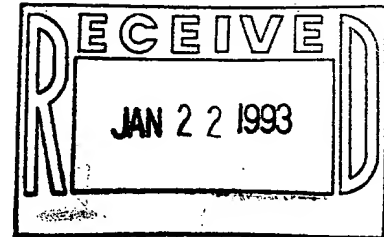
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TELEX 140342
FACSIMILE 419 244-8862

January 21, 1993



APR 22 2002

Ms. Patrice M. Stromberg
Legal Assistant
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, Minnesota 55311-3648

Re: Our Case No. 3570/216 - Linden et al.
U.S. Application Serial No. 07/913,227
INTRA-EXTRAVASCULAR DRUG DELIVERY
CATHETER AND METHOD

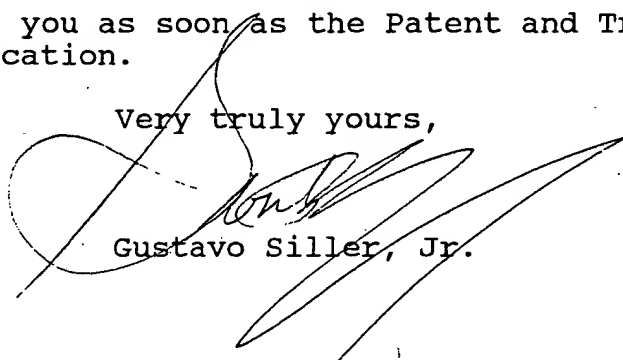
Dear Pat:

Enclosed for your files is the original Assignment conveying title in the above-identified United States patent application to SciMed Life Systems, Inc. This Assignment was recorded in the United States Patent and Trademark Office on August 26, 1992, on Reel 6241, Frames 0428-0431. We suggest that this Assignment be kept with your company's valuable papers.

It will be appreciated if you would sign and return the enclosed copy of the letter acknowledging receipt of the Assignment.

We will advise you as soon as the Patent and Trademark Office acts on the application.

Very truly yours,


Gustavo Siller, Jr.

GS/nhb
Enclosure
cc: Thomas Hektner

I hereby acknowledge receipt of the above-identified Assignment this ____ day of _____, 19__.

(Signature)

WILLIAN BRINKS OLDS HOFER GILSON & LIONE

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TELEPHONE 419 244-6578
TELEX 140342
FACSIMILE 419 244-8862

October 6, 1992

APR 22 2002

Ms. Patrice M. Stromberg
Legal Assistant
SCIMED LIFE SYSTEMS, INC.
6655 Wedgwood Road
Maple Grove, MN 55369

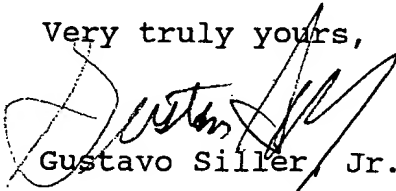
Re: Our Case No. 3570/216 - Linden et al.
U.S. Application Serial No. 07/913,227
INTRA-EXTRAVASCULAR DRUG DELIVERY
CATHETER AND METHOD

Dear Pat:

Enclosed for your files is a copy of the above-identified patent application as filed in the United States Patent and Trademark Office. This application has been assigned Serial No. 07/913,227, and has an official filing date of July 14, 1992.

We will advise you as soon as the Patent and Trademark Office acts on this application.

Very truly yours,


Gustavo Siller, Jr.

GS/ibr
Enclosure
cc: Thomas Hektner

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TELEX 140994
FACSIMILE 703 486-0187

GUSTAVO SILLER, JR.
(312) 321-4249

July 30, 1992

VIA FEDERAL EXPRESS

APR 22 2002

Ms. Patrice Stromberg
SciMed Life Systems, Inc.
6655 Wedgwood Road
Maple Grove, MN 55369

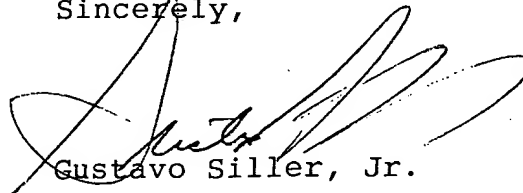
Re: U.S. Patent Application for
INTRA-EXTRAVASCULAR DRUG
DELIVERY CATHETER AND METHOD
Serial No.: 07/913,227
Filed: July 14, 1992

Dear Pat:

Please obtain the signatures of Brad Linden and Donald Palme II on the enclosed Assignment and Declaration and have the appropriate person at SciMed execute the Power of Attorney.

Should you have questions regarding the enclosed or any other matters, please do not hesitate to give me a call.

Sincerely,



Gustavo Siller, Jr.

GS, Jr./pdn
Enclosure

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Gustavo Siller, Jr., Esq.

William Brinks Olds Hofer et al

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Chicago, IL 60611-5599
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Reference Info

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SENDER'S COPY

Inventor(s): Bradley C. Linden and Donald C. Palme II

Title: INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD

POWER OF ATTORNEY

The specification of the above-identified patent application:

☐ is attached hereto☒ was filed on July 14, 1992 as application Serial No. 07/913,227

I hereby appoint the following attorneys to prosecute the patent application identified above and to transact all business in the Patent and Trademark Office connected therewith:

Henry L. Brinks	(Reg. No. 17,013)	Steven P. Shurtz	(Reg. No. 31,424)
Clyde F. Willian	(Reg. No. 18,456)	Rodney A. Daniel	(Reg. No. 31,605)
Roy E. Hofer	(Reg. No. 19,391)	Jeffery M. Duncan	(Reg. No. 31,609)
Richard G. Lione	(Reg. No. 19,795)	Thomas J. Filarski	(Reg. No. 31,612)
F. David AuBuchon	(Reg. No. 20,493)	Glen P. Belvis	(Reg. No. 31,735)
James B. Blanchard	(Reg. No. 21,054)	Hugh A. Abrams	(Reg. No. 31,937)
Melvin F. Jager	(Reg. No. 22,131)	Harold V. Johnson	(Reg. No. 31,972)
Robert L. Harmon	(Reg. No. 22,762)	Gustavo Siller, Jr.	(Reg. No. 32,305)
David A. Anderson	(Reg. No. 24,115)	Charles L. Roberts	(Reg. No. 32,434)
Jack C. Berenzweig	(Reg. No. 24,569)	Maxwell J. Petersen	(Reg. No. 32,772)
Raymond W. Green	(Reg. No. 24,587)	Frank J. Kozak	(Reg. No. 32,908)
John L. Cline	(Reg. No. 25,421)	Karl A. Vick	(Reg. No. 33,288)
Jerold A. Jacover	(Reg. No. 26,284)	Bradley G. Lane	(Reg. No. 33,411)
John J. Pavlak	(Reg. No. 26,785)	Lawrence M. Kaplan	(Reg. No. 33,521)
John K. Lucas	(Reg. No. 27,024)	Timothy Q. Delaney	(Reg. No. 33,674)
Allan J. Sternstein	(Reg. No. 27,396)	Barbara J. Luther	(Reg. No. 33,954)
John R. Crossan	(Reg. No. 27,433)	Frank C. Nicholas	(Reg. No. 33,983)
Steven Z. Szczepanski	(Reg. No. 27,957)	Ralph J. Gabric	(Reg. No. 34,167)
Gary M. Ropski	(Reg. No. 28,257)	Natalie D. Kadievitch	(Reg. No. 34,196)
William A. Webb	(Reg. No. 28,277)	Gregory L. Bradley	(Reg. No. 34,299)
Joel W. Benson	(Reg. No. 29,002)	Gary L. Hermanson	(Reg. No. 34,349)
William H. Frankel	(Reg. No. 30,337)	G. Peter Nichols	(Reg. No. 34,401)
Richard A. Kaplan	(Reg. No. 30,563)	Jonathan E. Retsky	(Reg. No. 34,415)
Michael H. Baniak	(Reg. No. 30,608)	Michael J. Jaro	(Reg. No. 34,472)
James R. Sobieraj	(Reg. No. 30,805)	John C. Freeman	(Reg. No. 34,483)
John A. Crook III	(Reg. No. 30,830)	William F. Prendergast	(Reg. No. 34,699)
Robert W. Stevenson	(Reg. No. 31,064)	Michael E. Milz	(Reg. No. 34,880)
Wannell M. Crook	(Reg. No. 31,071)	Donna M. Rogers	(Reg. No. 34,913)
Richard A. Cederroth	(Reg. No. 31,336)		

Please address all correspondence and telephone calls to Gustavo Siller, Jr. in care of:

WILLIAM BRINKS OLDS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

The undersigned hereby authorizes the U.S. attorneys named herein to accept and follow instructions from William Brinks Olds Hofer Gilson & Lione as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by the undersigned.

check one)

☐ Inventor(s)☒

Owner by Assignment

Date: SCIMED LIFE SYSTEMS, INC.

Assignee

Date:

Signature

Date:

Date:

Sr. Vice President, Technology & R&D
Name, Title

WILLIAN BRINKS OLDS HOFER GILSON & LIONE
P.O. Box 10395
Chicago, IL 60610
(312) 321-4200

Serial No.: 07/913,227
Filing Date: July 14, 1992

Case No. 3570/216

ASSIGNMENT

WHEREAS, Bradley C. Linden and Donald F. Palme II, hereinafter called the "Assignors", have jointly invented a new and useful INTRA-EXTRAVASCULAR DRUG DELIVERY CATHETER AND METHOD, for a full description of which reference is ~~here~~ made) U.S. Patent Application Serial No. 07/913,227, filed July 14, 1992; and, in

WHEREAS, SciMed Life Systems, Inc., a corporation organized and existing under the laws of the State of Minnesota, having a place of business in the City of Maple Grove, State of Minnesota, hereinafter called the "Assignee", is desirous of acquiring the entire right, title and interest in and to said invention, the application above identified, and in, to and under Letters Patent which may be obtained for said invention, as hereinafter more fully set forth;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, be it known that for and in consideration of the sum of One Dollar (\$1.00), and other valuable and legally sufficient considerations, the receipt of which by the Assignors from the Assignee is hereby acknowledged, the Assignors have sold, assigned and transferred, and by these presents do sell, assign and transfer unto the Assignee, the entire right, title and interest for the United States in and to the invention and application hereinabove identified, and any Letters Patent of the United States that may issue for said invention, together with the entire right, title and interest in and to said invention and application for Letters Patent and Letters Patent therefor, in all countries foreign to the United States, including the full right to claim for any such application all benefits and priority rights under any applicable convention; to have and to hold for the sole and exclusive use and benefit of the Assignee, its successors and assigns, to the full end of the term or terms for which any and all of said Letters Patent for said invention may issue.

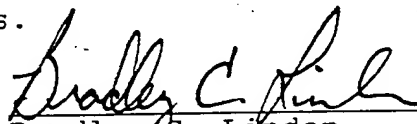
And the Assignors do hereby covenant and agree, for themselves and their legal representatives, that they will assist their Assignee in the prosecution of the application herein identified; in the making and prosecution of any other applications for Letters Patent that the Assignee may elect to make covering the invention herein identified, as hereinbefore set forth; in vesting in the Assignee like exclusive title in and to all such other applications and Letters Patent; and in the prosecution of any interference which may arise involving said invention, or any application or Letters Patent herein contemplated; and that they will execute and deliver to the Assignee any and all additional papers which may be requested by the Assignee to fully carry out the terms of this Assignment.

And the Commissioner of Patents and Trademarks is hereby authorized and requested to issue Letters Patent to the Assignee in accordance with the terms of this Assignment.

IN TESTIMONY WHEREOF, the Assignors have hereunto set their hands and affixed their seals.

DATE:

August 5, 1992

 (SEAL)
Bradley C. Linden

DATE:

August 6, 1992

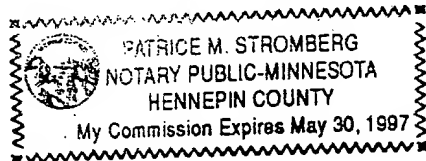
 (SEAL)
Donald F. Palme II

STATE OF MINNESOTA)
) ss.
COUNTY OF Hennepin)

I, Patrice M. Stromberg, a Notary Public in and for the County and State aforesaid, do hereby certify that Bradley C. Linden, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that he signed, sealed and delivered the said instrument as his free and voluntary act for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and Notarial Seal, this 5th day of August, 1992.

(SEAL)



Patrice M. Stromberg
Notary Public

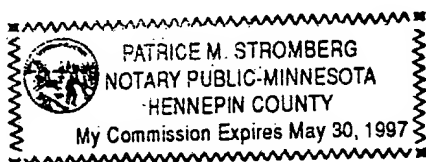
My Commission Expires: 5-30-97

STATE OF Minnesota)
) ss.
COUNTY OF Hennepin)

I, Patrice M. Stromberg, a Notary Public in and for the County and State aforesaid, do hereby certify that Donald F. Palme II, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that he signed, sealed and delivered the said instrument as his free and voluntary act for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and Notarial Seal, this 6th day of August, 1992.

(SEAL)



Patrice M. Stromberg
Notary Public

My Commission Expires: 5-30-97



VIA FEDERAL EXPRESS

June 30, 1992

Gustavo Siller, Jr., Esq.
William Brinks Olds Hofer
Gilson & Lione
NBC Tower
455 North Cityfront Plaza Drive
Suite 3600
Chicago, IL 60611-5599

APR 22 2002

Re: New Disclosure on Drug Delivery Concept

Dear Gus:

Attached is a disclosure package on a new extra vascular drug delivery concept. The inventor is Brad Linden.

SCIMED has deemed this high priority, and we would like to see a search started immediately. We would like to see a draft on this invention by August 1, and we are shooting for a September 1 filing date.

My involvement in this matter is only to specify priority, to help out when necessary, and to monitor progress.

Please direct all correspondence regarding this idea to Brad Linden, Pat Stromberg and myself. If you have any questions, please direct them towards Brad Linden at x0564. If there is anything that I can help with, please feel free to ask. Thank you in advance for all of your help.

Sincerely,

SCIMED LIFE SYSTEMS, INC.

A handwritten signature in black ink, appearing to read 'David A. VandenEinde'.

David A. VandenEinde
Patent Engineer
THE PTR GROUP

DAV/ps
Enclosures

SCIMED

APR 22 2002

Method for Delivering Drugs
Extra Vascularly and
Device Therefor
6/30/92

Inventor:

Brad Linden
Don Palme

Date of Invention:

3/18/92

Law Firm:

Willian Brinks Olds

SciMed Idea File #

000156

Contents:

Initial Invention Disclosures
Summary Page
Technical Package

Pages 2 thru 11
Page 12
Pages 13 thru 24

Letter of Disclosure

Invention: A method for the site specific extravascular controlled release of therapeutic agents for the treatment of restenosis, thrombosis, and/or cardiovascular disease.

Abstract: This method involves the implantaion of a biodegradeable material in close proximity to the extravascular side of a coronary artery where the implant will remain and release its therapeutic agent over a period of time. This invention involves several specific points.

1. The controlled release device:

- A. The device can be a polymeric rod or spike loaded with drug, which can be implanted next to an area on the heart which is to be treated.
- B. The device can be an injection of microcapsules loaded with drug, which can be placed in close proximity to the area of interest on the heart.
- C. The device can be an emulsion of liposomes loaded with drug, which can be placed in close proximity to the area of interest.

2. The delivery system:

- A. The controlled release device can be delivered via a catheter based system.
- B. The drug delivery system can be delivered surgically.
- C. The drug delivery system can be delivered via a non-catheter based injection system.

3. The therapeutic agent:

A. The drug can be a, or any combination of:

- A.1. A Thrombolytic
- A.2. An Anti-thrombotic
- A.3. An Anti-proliferative
- A.4. An Anti-platelet
- A.5. A Protein
- A.6. A Peptide
- A.7. A fragment of a recombinant peptide/protein
- A.8. A fragment of a non-recombinant peptide/protein
- A.9. Genetic material
- A.10. A recombinant peptide/protein
- A.11. A non-recombinant peptide/protein
- A.12. A glycoprotein
- A.13. A fragment of a glycoprotein
- A.14. A recombinant glycoprotein
- A.15. A fragment of a recombinant glycoprotein
- A.16. A Carbohydrate or a fragment thereof
- A.17. An Antiarrhythmic
- A.18. A beta blocker
- A.19. A calcium channel blocker
- A.20. A vasodilator
- A.21. A vasoconstrictor
- A.22. An inorganic ion or mixture thereof

Inventor:

Donald F. Palmer II

Date: 3/18/92

Inventor:

Bruce C. Smith

Date: 3/18/92

Witness:
Robert A. Smith
3/20/92

Interventional Therapeutics Program

Devices for site specific drug delivery

ADDENDUM TO DISCLOSURE: EXTRAVASCULAR DRUG DELIVERY

This document describes additional ideas with respect to disclosure made in March 1992 by Brad Linden.

Extravascular drug delivery can provide ideal pharmacologic circumstances for the delivery and uptake of drugs. This is due to the fact that intravascularly delivered drugs are diluted and whisked away by the blood before they have time to act on their target(s). When a drug is delivered peri-adventitially, it has the opportunity to remain in the vicinity of its delivery for sustained periods of time which allows the drug time to diffuse into the vessel from the outside. The obvious question is: How do we do it?

There are two possible approaches:

1. Approach from the outside of the vessel.
2. Approach from the inside of the vessel.

Approach 1:

The vessel can be approached from the outside via a "self-guiding" catheter which may be introduced into the thorax through a sub-xiphoid ventral incision approach, or a lateral or dorsal incision through the intercostal (between the ribs) muscles, whichever would be most advantageous to reach the coronary vessel or region of choice. This procedure could be performed under fluoroscopy using a balloon catheter placed at the PTCA site as a marker.

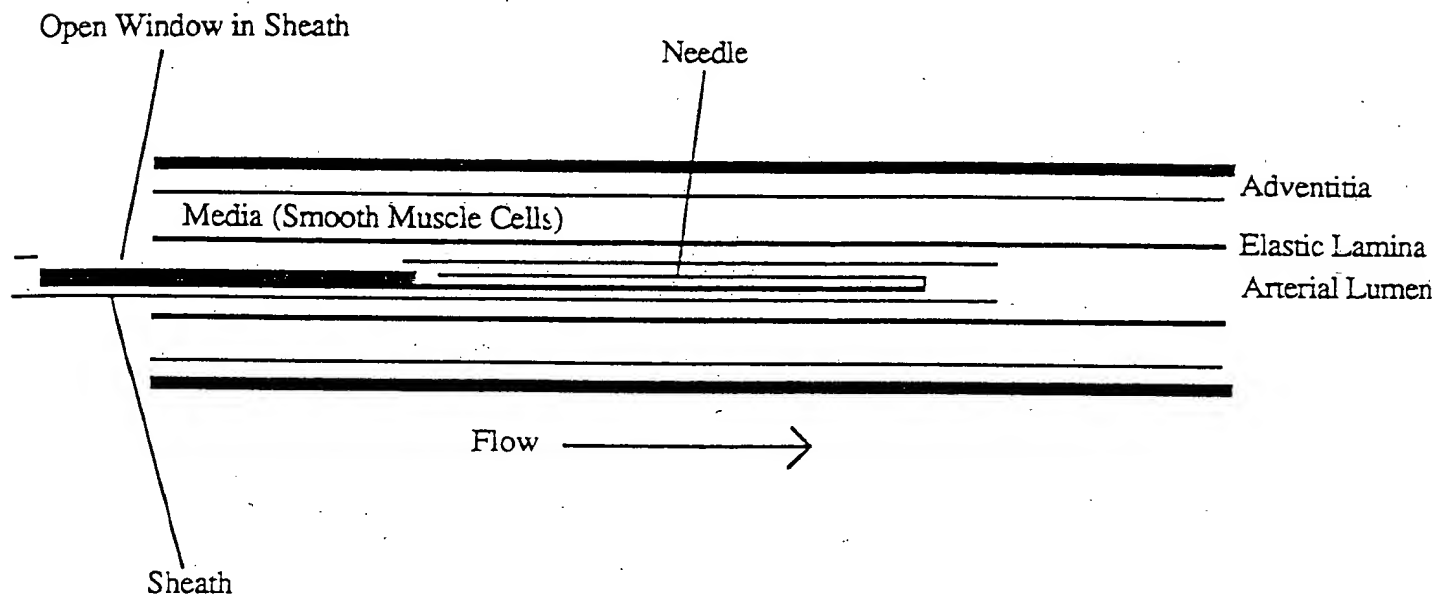
Approach 2:

The vessel can be approached from the inside and then gain access to the exterior of the vessel (intra-extravascular delivery).

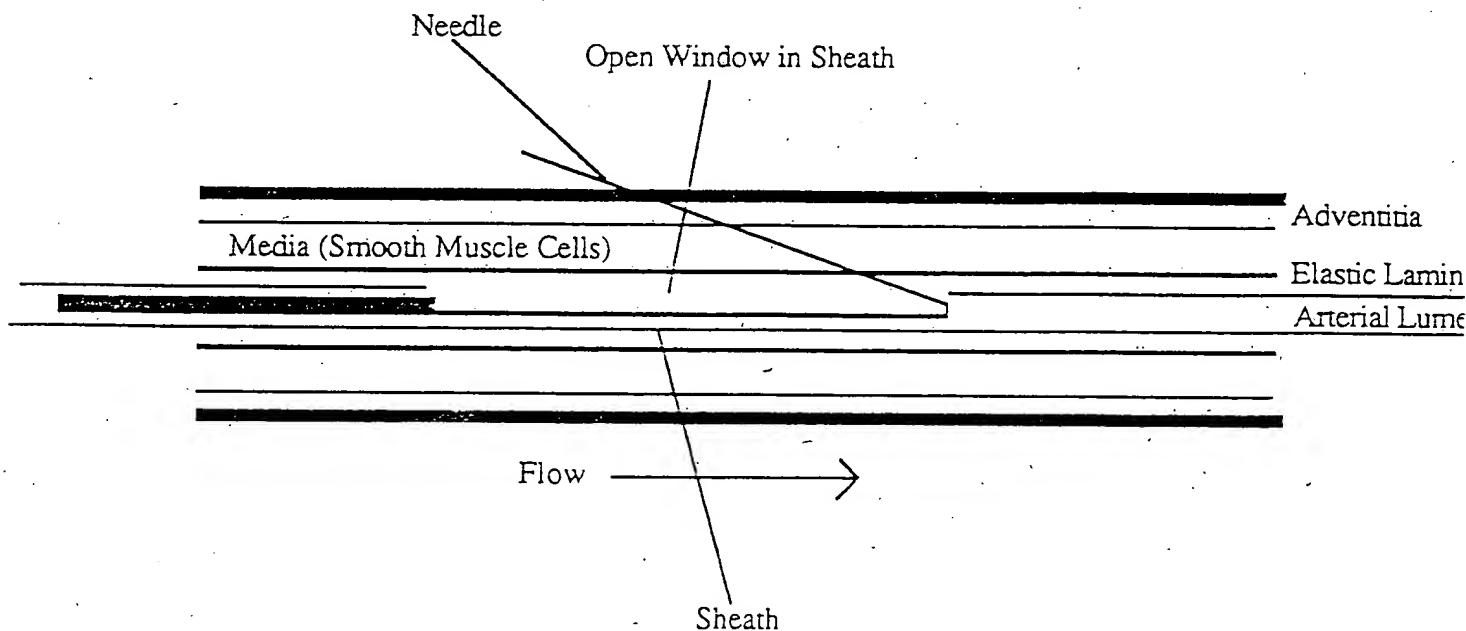
With the advent of some of the newer technologies it has become a relatively routine event to perforate an artery while performing one of these procedures. While this event is harrowing, it does not always spell CABG. I propose that an artery can be selectively and safely perforated with a small gauge needle, and that therapeutic agents can then be delivered to the peri-adventitial space. This can be achieved using a device as follows:

Interventional Therapeutics Program

Devices for site specific drug delivery



The device can be guided to a site under fluoroscopy using standard PTCA guiding catheter and guidewire techniques. The sheath can be advanced to place an open window over the radiopaque needle so the needle may be released and orient itself at an angle to the shaft with a certain degree of opening force. The catheter can then be pulled back to insert the needle into the vessel wall and exit on the adventitial side. Therapeutic agent can be infused over most any period of time because the device does not block flow. After the infusion is complete, the catheter can be pushed forward to remove the needle from the vessel wall, and the sheath can be pulled back to force the needle back into a position parallel to the catheter shaft.



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Devices for site specific drug delivery

The angled retrograde path of the needle protects the needle track from being filled with flowing blood and causing dissection, and allowing the track to clot closed.

Visualization can be aided by the use of various radiopaque parts.

Guidance of the needle can be monitored by incorporating intravascular ultrasound into the device to determine when the adventitia has been reached.

Other Therapeutic Uses:

This device could be used for the treatment of various disorders involving vessel-like lumens in the body, such as prostatitis, the delivery of cancer chemotherapeutics, and the site specific delivery of controlled release antibiotics for the treatment of pericarditis.

Inventor Bradley C. Smith Date 6/16/97

Witness [Signature] Date 6/16/97

Interventional Therapeutics Program

Devices for site specific drug delivery

**Addendum to Extravascular
Drug Delivery Disclosure**

Bradley C. Linden
6/28/92

The device can have needles of various:

1. Sizes - IDs from less than .001 inches and ODs from smaller than 36 gauge.

2. Lumen shapes - The lumen of the needle may not only be round, but other shapes which may effect the performance of the device. Therefore, the lumen may be:

1. Oval
2. Rhomboid
3. Trapazoidal
4. Triangular
5. Round
6. Rectangular

3. Needle shapes - The needle may have intricate shapes which enable the device perform optimally.

4. Cuts - The cut at the end of the needle can optimize performance of the device, patterns can be formed on the sharpened end of the needle to optimize its properties.

DEVICE DESIGNS:

Design1: The device can be comprised of:

1. A multiple lumen tube, one of which serves as a guidewire lumen which is in communication with a port on the manifold, and another (one or more) serves to house the "Delivery apparatus".

Interventional Therapeutics Program

Devices for site specific drug delivery

2. A manifold which is comprised of:

a. An external body having a port for the introduction of a guidewire which communicates with the guidewire lumen through the length of the device, and a "locking mechanism" which operates via a "cam" action to immobilize an "actuator".

b. A "Actuator" which is in communication with the "delivery apparatus" in such a way that a solution can be infused through a fitting part of the actuator, and that fluid can then flow through a lumen or lumens of the "delivery apparatus" exiting out the needle/s.

3. An inflatable balloon can be incorporated into the device to enable the controlled placement/penetration of the needle/s.

4. The position of the components of the device can be monitored under fluoroscopy with the aid of marker bands or other means to denote the position of the various components of the device with respect to one another and or other components used in the procedure.

5. The "delivery apparatus" can be comprised of:

a. A single needle or a multitude of needles

b. Needles composed of:

Spring steel

Stainless steel

Titanium

Nitinol

A polymer or copolymer

Any combination of the above

c. Hypotubes composed of:

Spring steel

Stainless steel

Titanium

Nitinol

Interventional Therapeutics Program

Devices for site specific drug delivery

A polymer or copolymer
Any combination of the above

6. A balloon can be part of the device, located either proximal to, distal to, or at to the needle section. This balloon can serve as a means for inducing haemostasis at the site of puncture, or it may be used for dilatation before, during, or after the drug delivery, or the balloon can be used to perform a PTCA or PTCA-like procedure.

7. The device can be coated with a material that will make it detectable (or more so) by intravascular ultrasound. The location of the components of the delivery apparatus can then be determined with respect to one another via the use of a separate intravascular ultrasound probe, or a probe which is a component of the device itself. This will allow the user to monitor the position of the needle as it enters its target site.

8. The device can be coated with a material that will enable or enhance its visualization by:

MRI
CT scan
X-Ray
Gamma camera imaging
PET scan

METHOD:

This device can be used to treat:

Pulmonary sites
Genitourinary sites
Cardiovascular sites
Gastrointestinal sites
Cerebral sites
Peritoneal sites
Ophthalmic sites

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Devices for site specific drug delivery

Pancreatic sites
Hepatic sites
Skeletal muscle, connective tissues, and bone sites
Nervous system sites
Thrombus
Plaque
Different regions of the vessel wall
Dissections
Vessel wall/body lumen or cavity abnormalities (ie aneurisms)

The device can be used to place drug impregnated polymer in various configurations (such as a rod) at a site.

The needle/s or a conductor can be heated or cooled to enhance the performance of the device.

The needle/s or a conductor can be made to vibrate at various frequencies to enhance the performance of the device (ie optimize drug delivery).

The delivery apparatus can have a means for the conduction, transfer, or passage of light energy which is, or is not an intimate part of the "needle" or any other part of the device.

The device can be used to deliver any wavelength of light to a specific portion of the lumen or body cavity of choice.

The device can be used to deliver any wavelength of light to a specific portion of the vessel wall.

The device can be used to deliver any wavelength of light to a specific portion of the adventitia.

The device can be used to deliver and activate light activated drugs.

The device can be used to deliver and activate heat/cold activated drugs.

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Interventional Therapeutics Program

Devices for site specific drug delivery

The device can be used to deliver and activate sonically activated drugs.

The device can be used to deliver a substance which will carry the energy of light through wavelenth and/or energy transitions.

The device can be used to deliver a substance which will carry energy through wavelenth and/or energy transitions.

The device can be used to deliver and activate electrically activated drugs.

The device can have selectively or non-selectively magnetized elements.

The device can be used to induce an electric charge in an area.

The device can be used to induce a magnetic field in an area.

The device can be used to deliver perfluorocarbon (or any oxygen carrying compound) compounds for the treatment of cardiac or non-cardiac ischemia.

The device can deliver a matrix to the exterior of a body lumen or cavity to structurally reinforce the area, drug can be impregnated in this matrix and delivered coincidently.

The device can be used to deliver a material that can be hardened in the wall or on the adventitial side to be used as an extravascular stent.

The device can be used to deliver a material that can be hardened in the wall or on the adventitial side to be used as an intravascular stent.

The device can be used to remove things or substances.

A vacuum can be placed in the delivery apparatus (microsuction).

Bradley C. Kline

6/30/92

ss: David A. Vukobratovic

6/30/92

Summary Page:

IT IS EXTREMELY IMPORTANT FOR US TO NOTE THAT THERE IS INTENT FOR SCIMED TO PUBLICLY DISCLOSE THIS IDEA ON JULY 1, 1992. (THIS DISCLOSURE IS BY TOM HEKTNER, AND MAY OR MAY NOT BE DONE CONFIDENTIALLY.)

Intent:

A method for the site specific extra vascular controlled release of therapeutic agents for the treatment of restenosis, thrombosis, and/or cardiovascular disease. More specifically, one embodiment is the use of an implantible biodegradable material for a timed release of the therapeutic agent. Another embodiment is the use of a intra-extra vascular delivery device, where there is a device in the blood vessel that can access the exterior of the vessel through some mechanical means (i.e. puncturing the wall of the vessel with a tiny needle).

NOTE: This device could be used for the delivery of any therapeutic agent....whether controlled release or not.

Areas of Novelty:

- the device itself
- external delivery via an internal catheter
- device that does not occlude blood flow during delivery
- low profile delivery device

Try to go for:

Broad claims on the METHOD of extra vascular drug delivery.

Broad claims on the METHOD of going from the inside to the outside of a vessel to deliver drugs.

Device claims on the intra-extra vascular device.

Claims on a drug delivery device that does not occlude flow during drug delivery

Prior Art Summary:

Doing a quick search in house on the dialog database service, and using the keywords listed below, here is what we found to be of potential relevance:

Keywords:	Drug	Vascular	Deliver
	Therapeutic	Artery	Dispense
	Outside	Lumen	Extra
	Extravascular	peri-adventitial	perforate
	puncture		

Results: Nothing Found

Restenosis Summit 1992

POLYMER STENTS

Speaker: Gershon Golomb, PH.D.

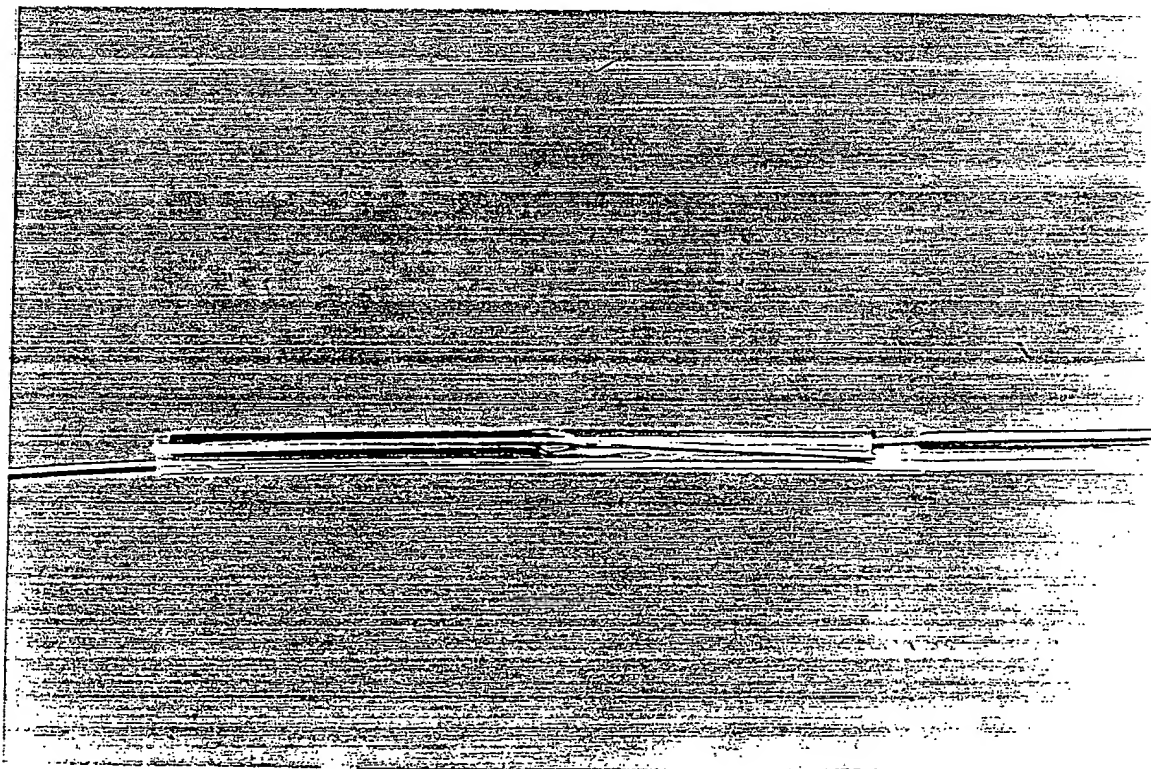
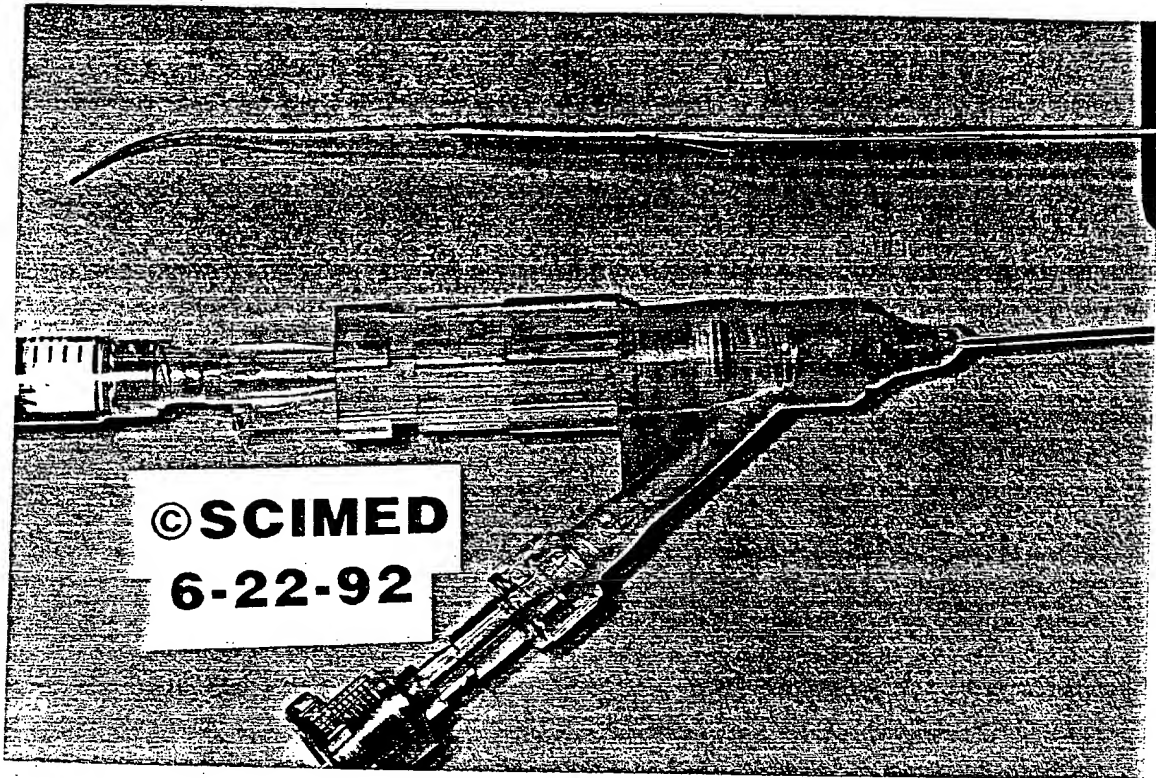
Syllabus:

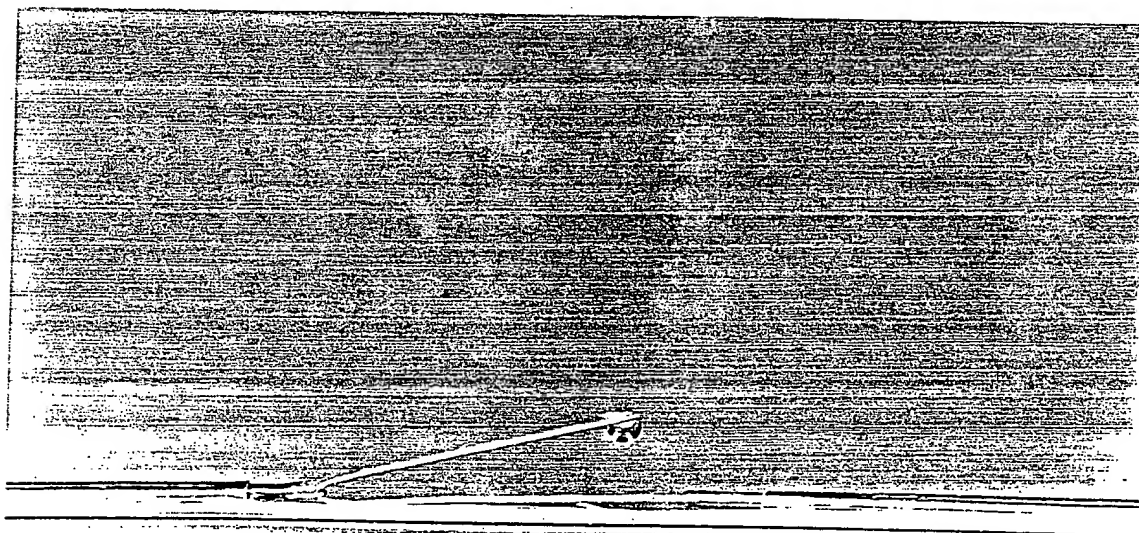
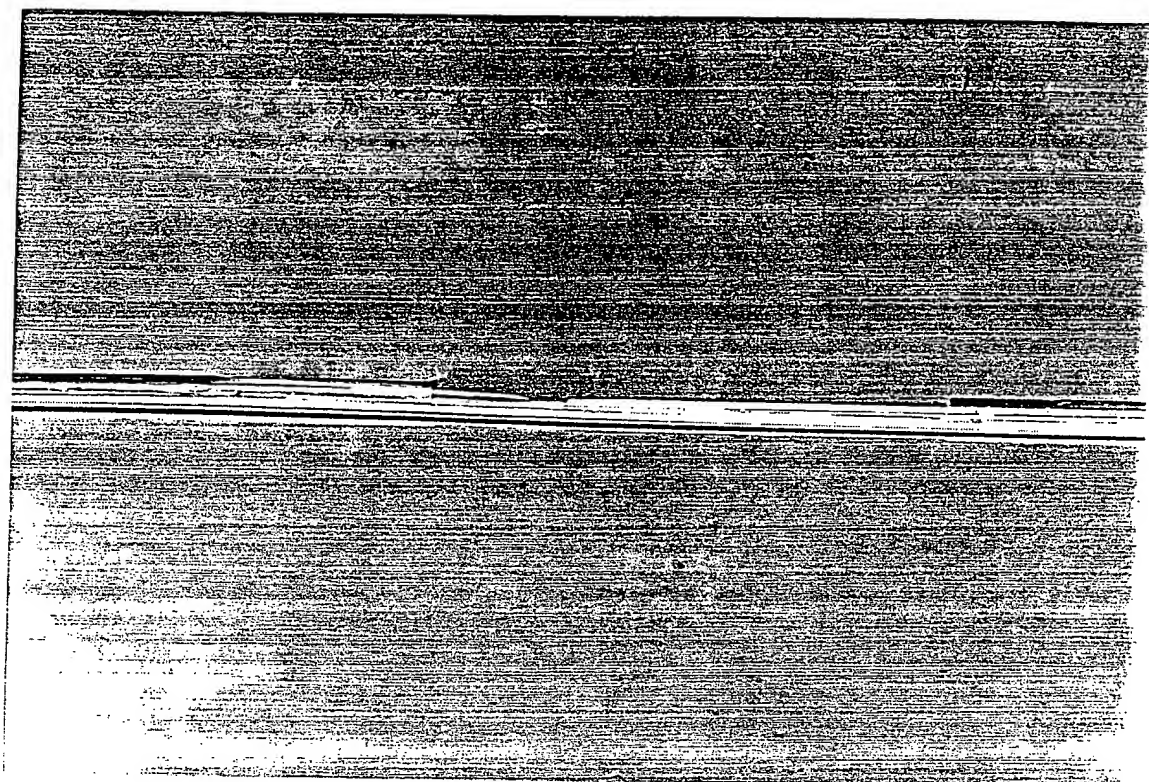
STRATEGIES FOR TREATING ARTERIAL RESTENOSIS
USING POLYMERIC CONTROLLED RELEASE IMPLANTS

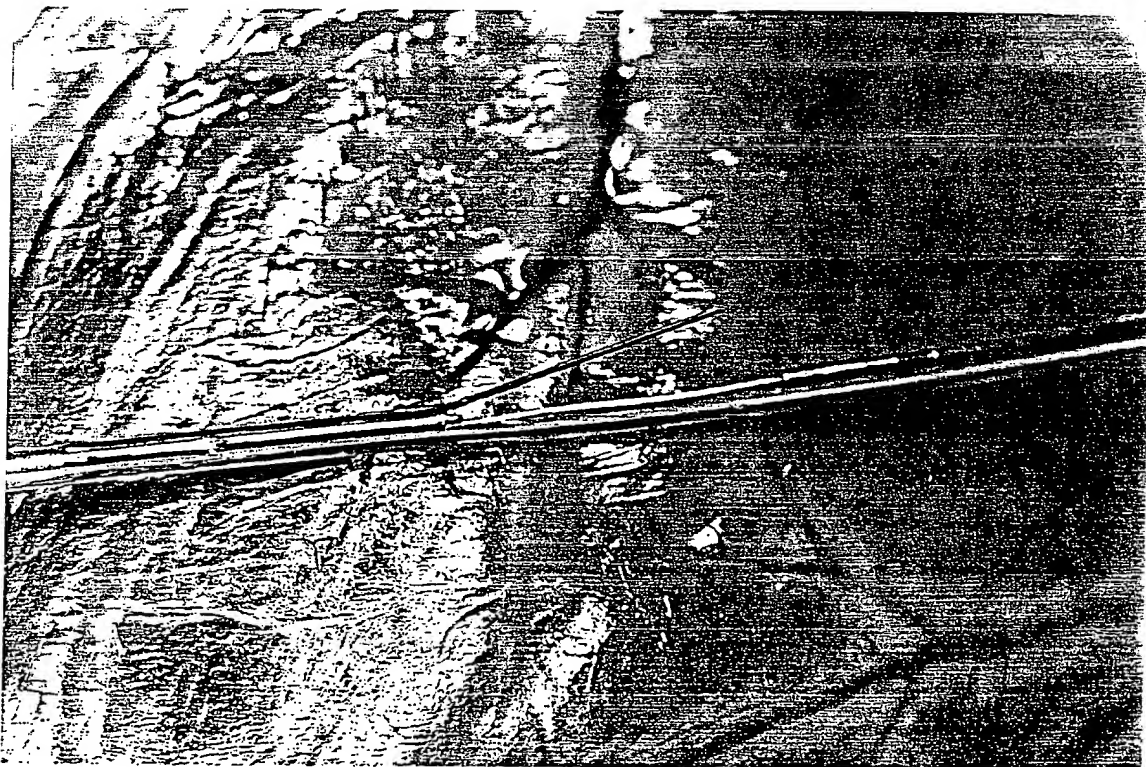
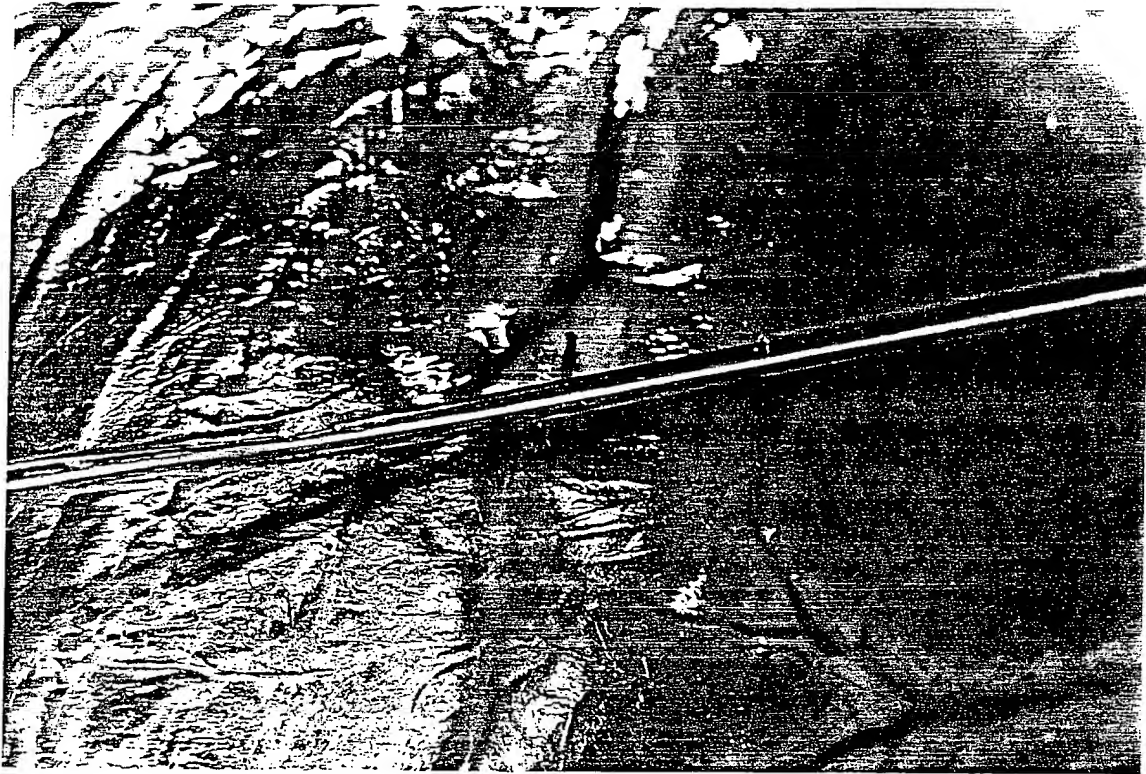
Robert J. Levy¹, Gershon Golomb², Joseph Trachy¹,
Vinod Labhasetwar¹, David Muller¹, and Eric Topol³

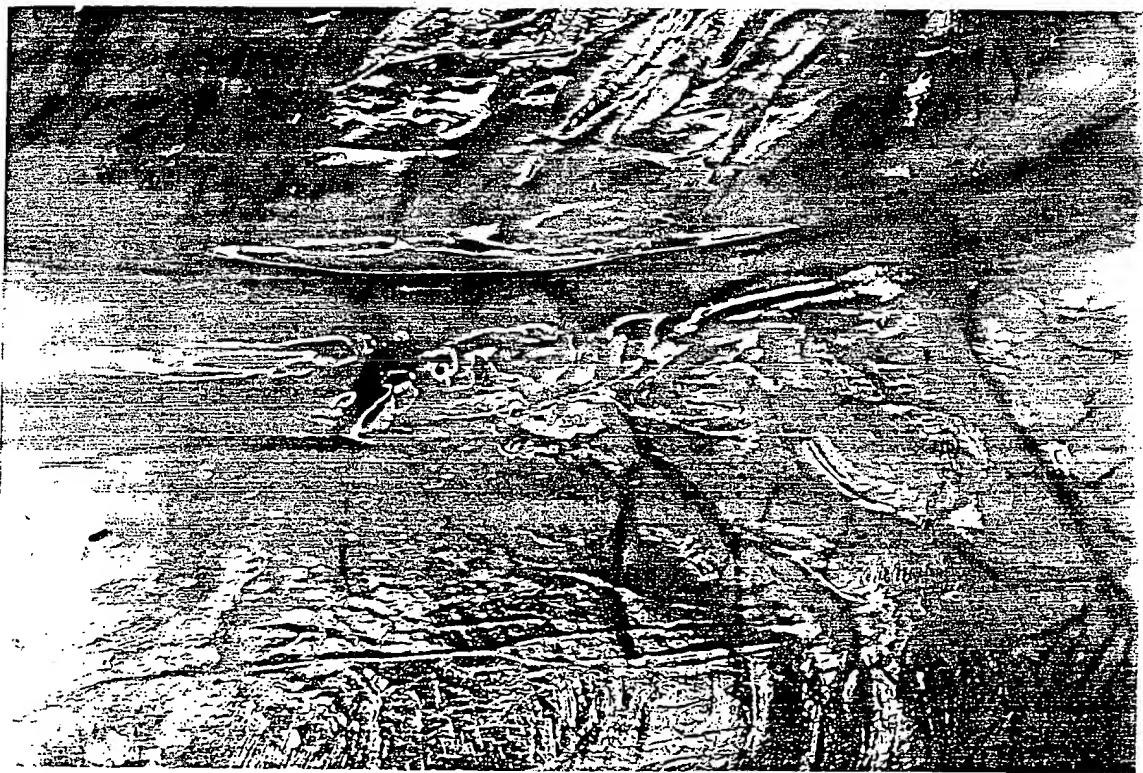
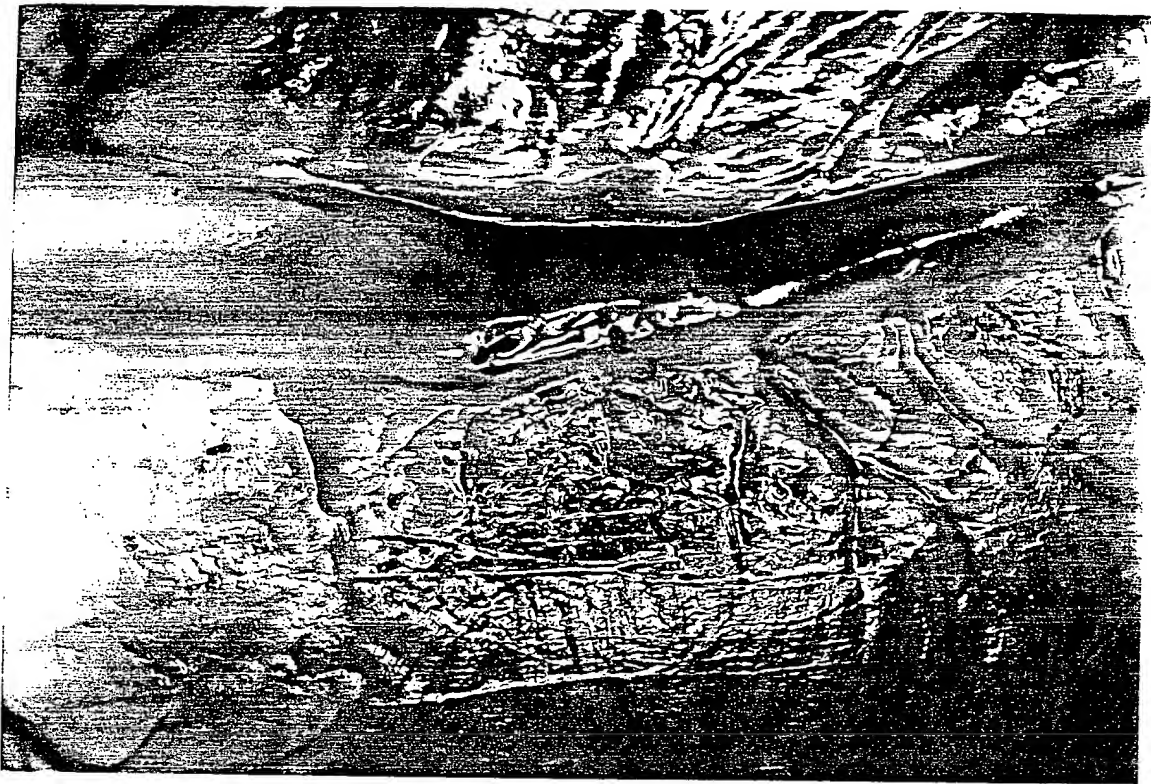
[In Press, Biotechnology and Bioactive Polymers,
ed. C. G. Gebelein, Plenum, N.Y.]

All of the above clinical strategies have also been investigated in various animal studies, which have indicated some preliminary benefit. Most recently, studies by Edelman and his colleagues, have demonstrated that periarterial drug administration using heparin-ethylenevinyl acetate composites significantly inhibited restenosis in a rat arterial injury model.^{11,12} This initial success of a controlled release drug delivery approach to restenosis has stimulated interest in the field. Controlled release drug implants have been used by our group and others to treat a variety of cardiovascular diseases, and this approach is uniquely suited for this general group of disorders.¹³ Controlled release may be defined as formulations of drug polymer composites, either as monolithic matrices or reservoirs with rate limiting membrane configurations, in which drug administration can be sustained through the use of polymeric materials. Implantation of controlled release polymer systems at the site of a cardiovascular disease process offers the advantages of regional high levels of drug, with optimal drug action, as well as lowering systemic drug exposure, and thereby minimizing the possibility of side effects.

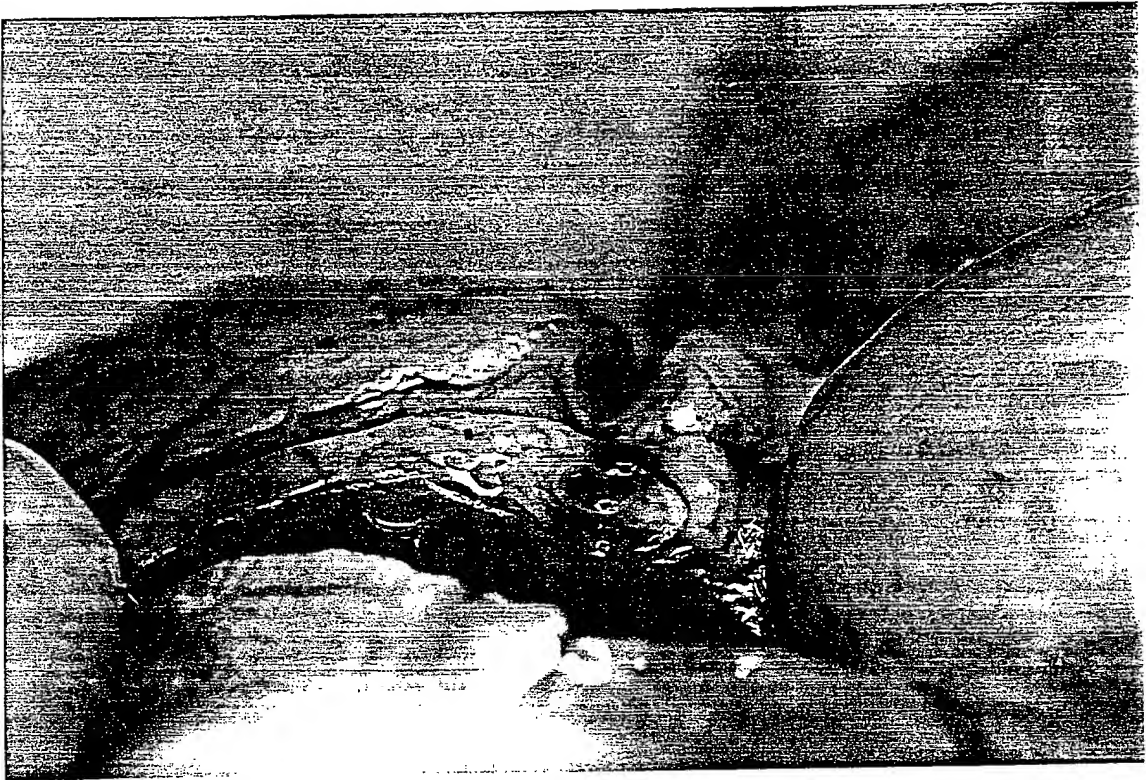




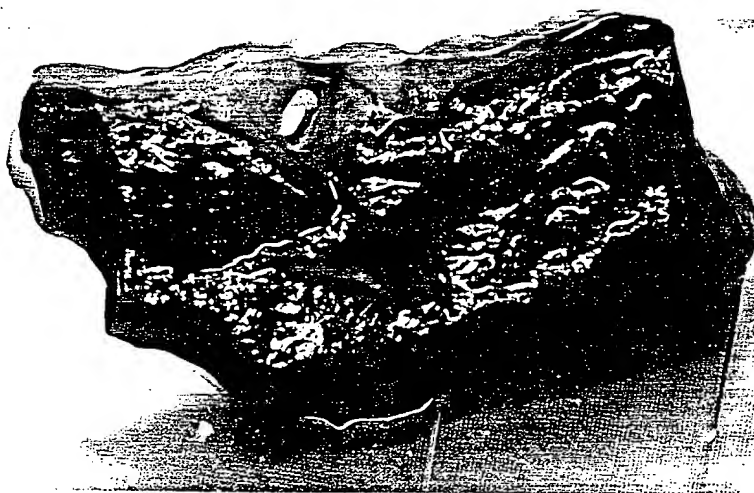


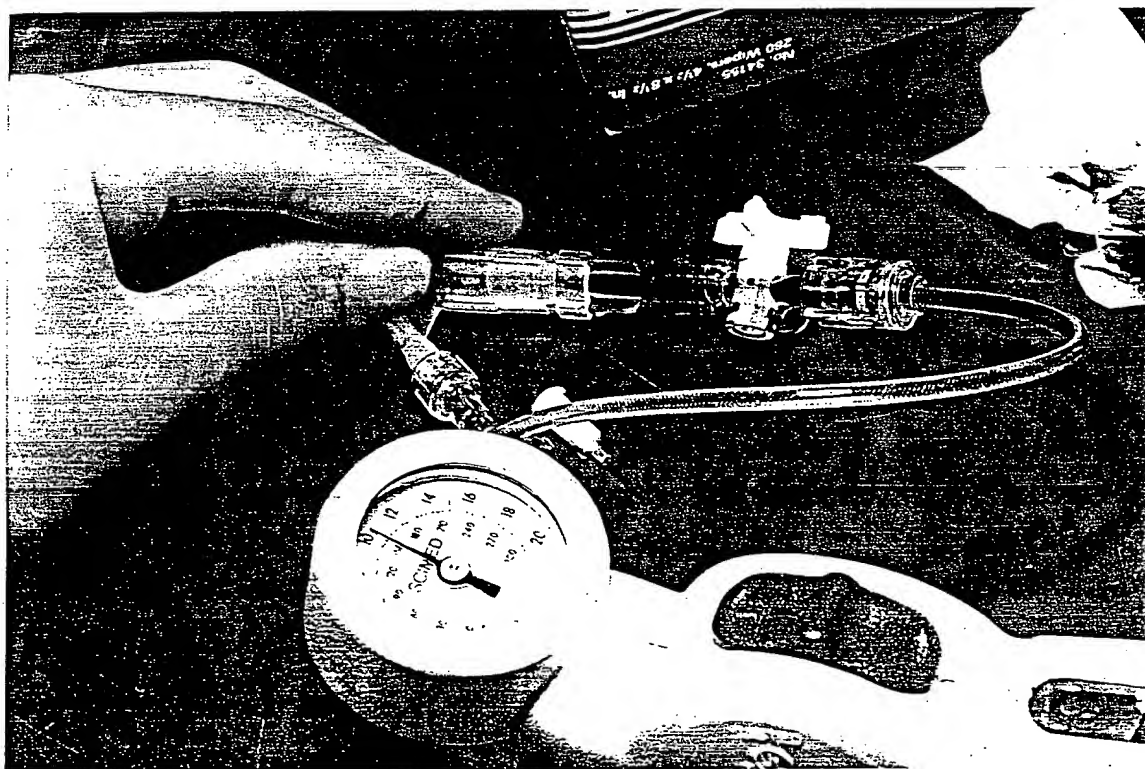
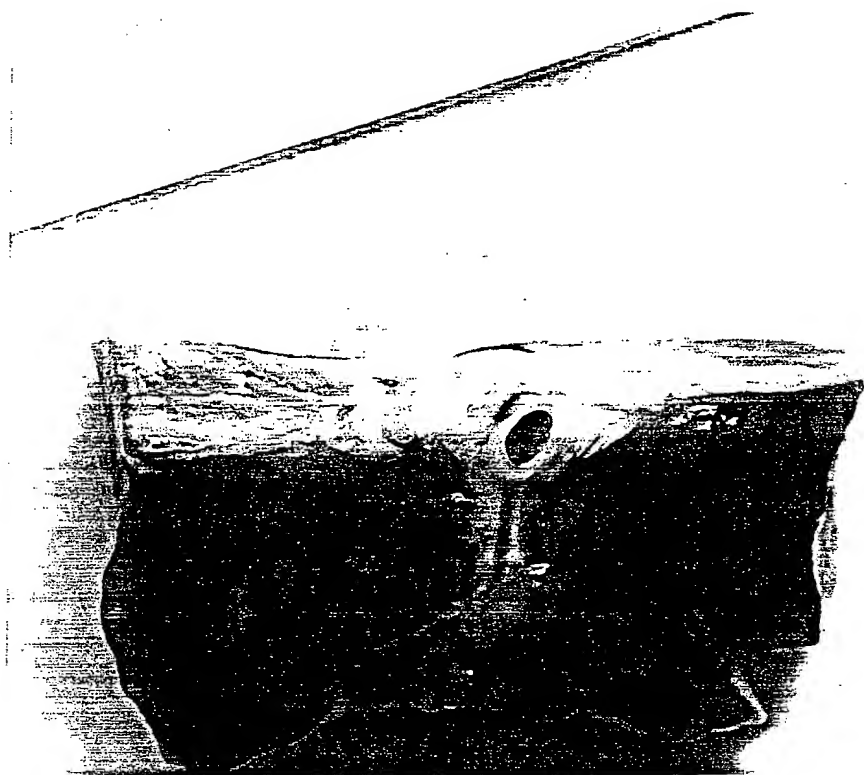


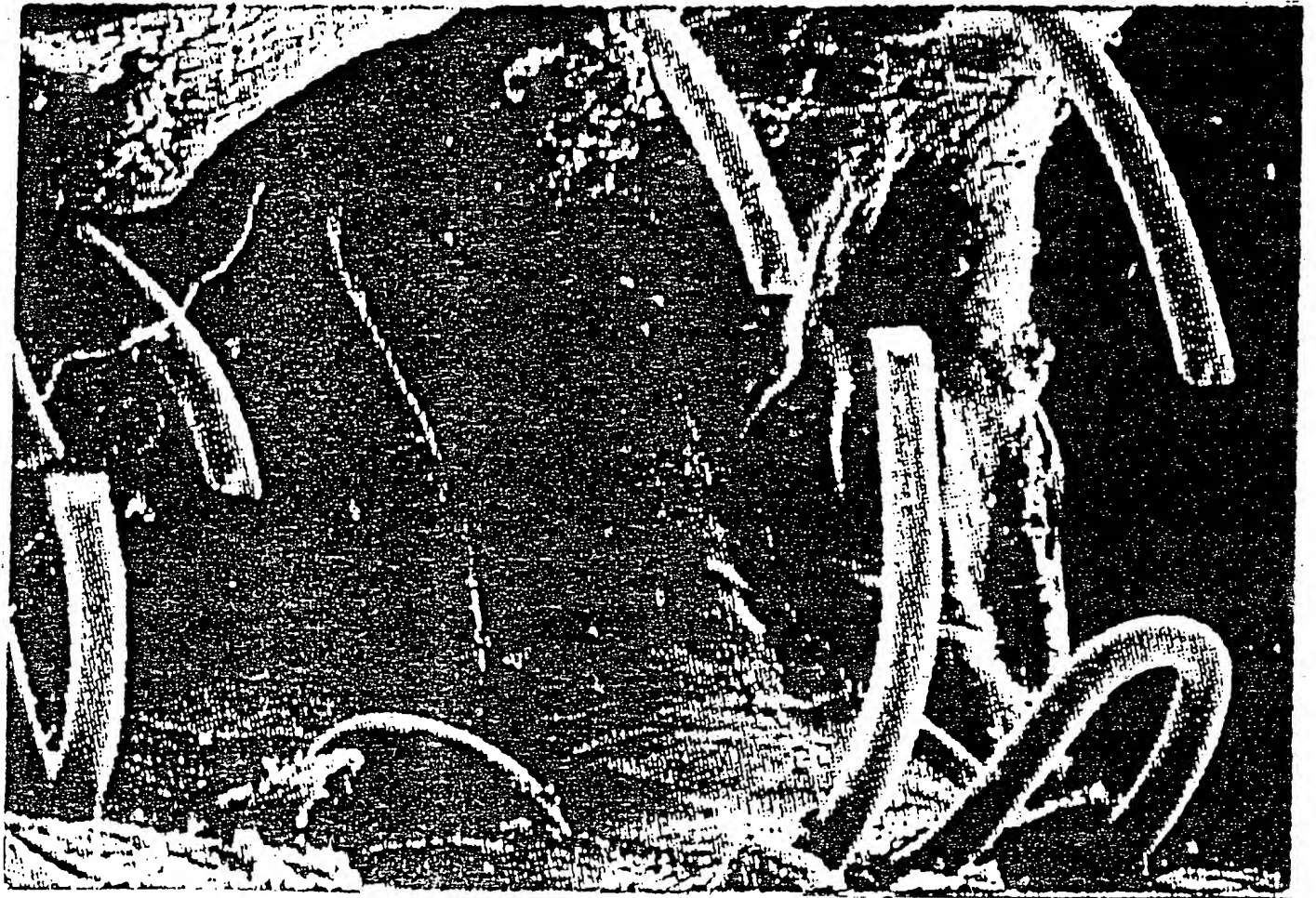


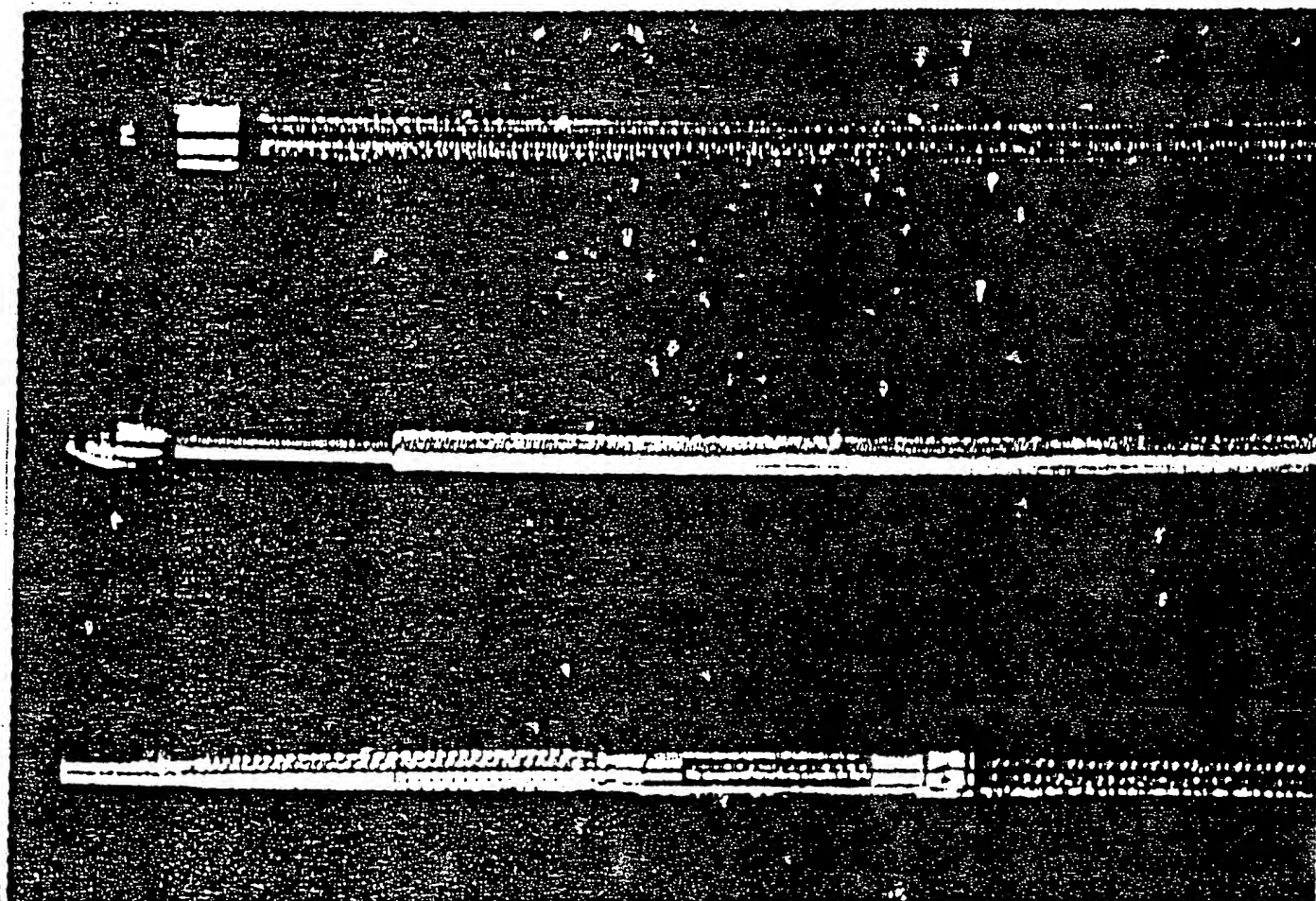




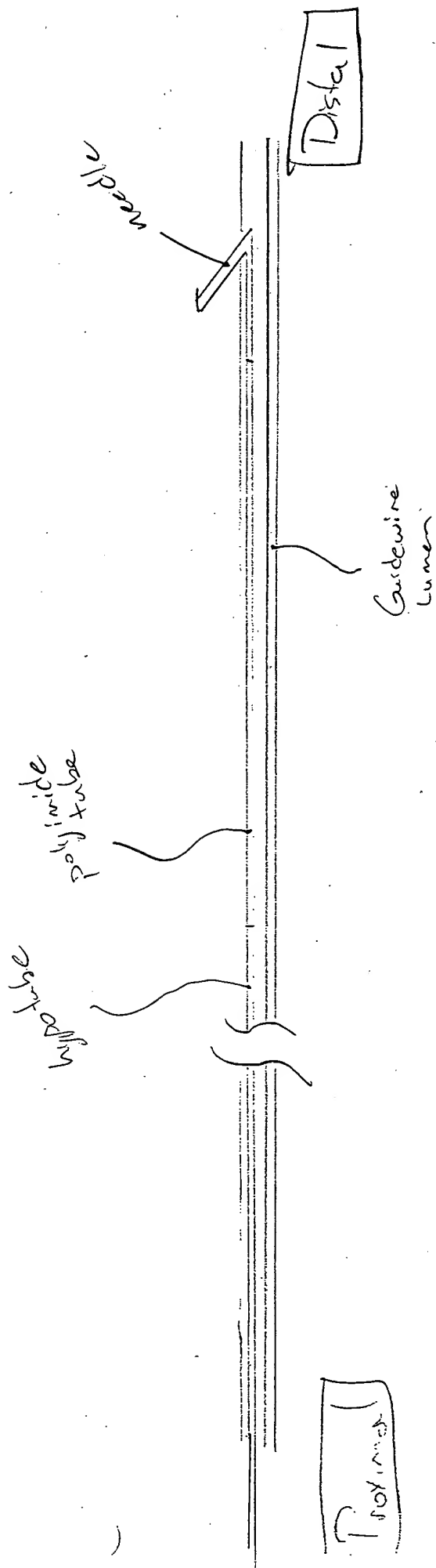








Multiple communicating
hydrotube materials



APR 22 2002

2115

Distal tip

Beveled needle point
(angulation of needle point can be varied for different cutting effects)

large lumen
1/2 - 2/3 inch
width

Window

angulation can be changed for different cutting effects

Polyimide tubing

Proximal

Distal

Stainless steel hypotube

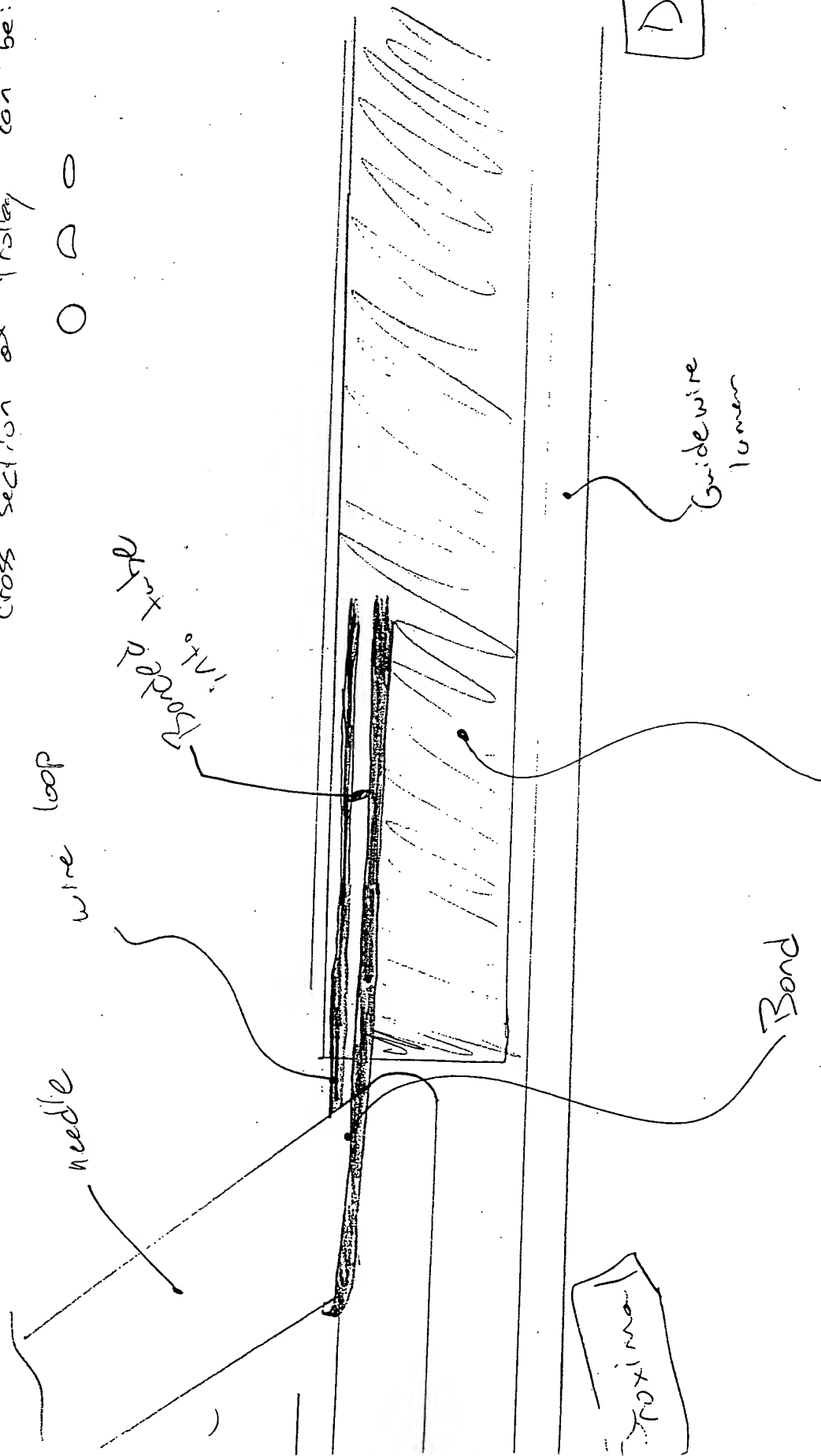
Guidewire lumen
Currently accepts .014" wire



Dual Lumen
Cross-Section

Tracking Trolley

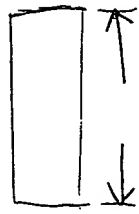
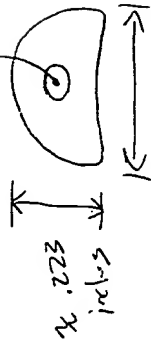
cross section of trolley can be:



Tubing filled with adhesive

Purpose: Trolley guides the needle back into window when the hip tube is

~.019 inches

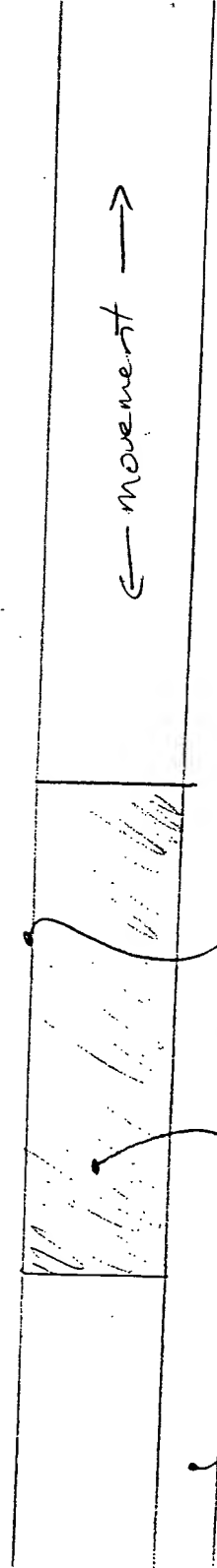
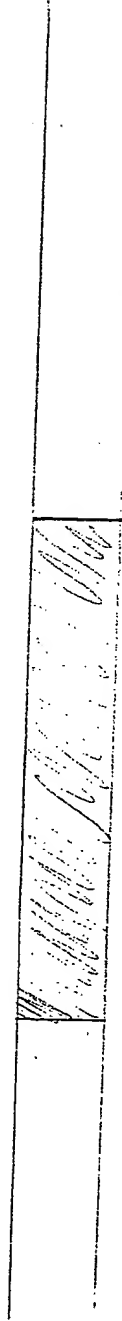


Material: Platinum
PTFE

~.094 inches

~.418 inches

Anti-Rotation Cams



Guidewire
lumen

Bond to hypotube

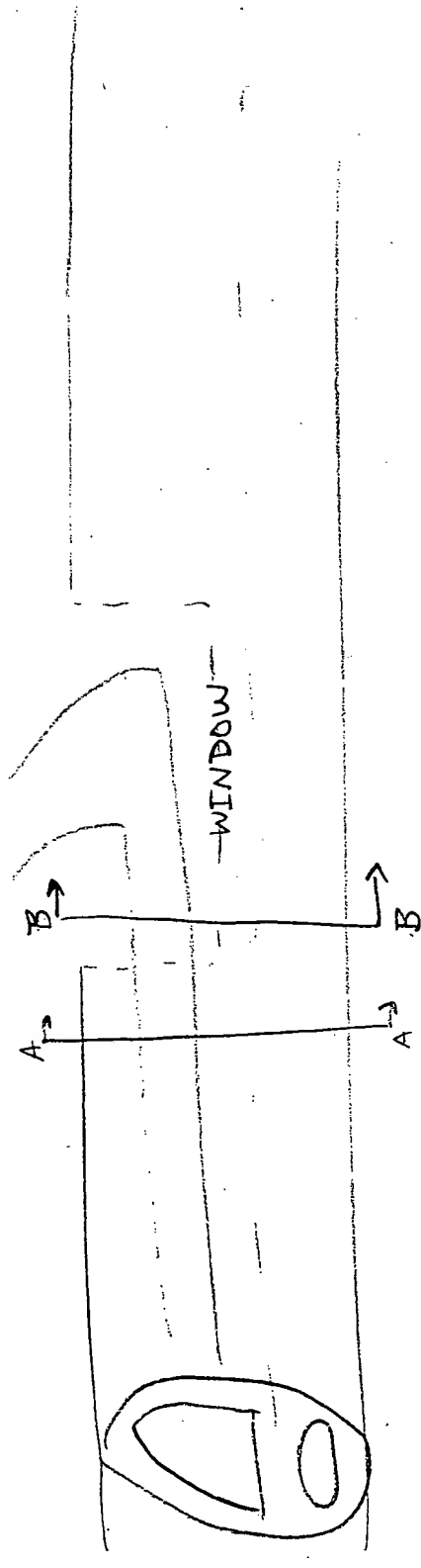
Can

Optical

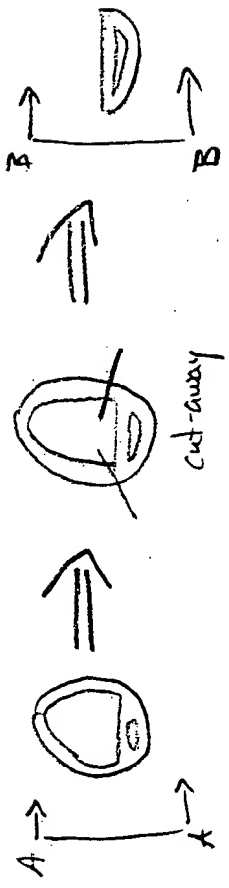
Guidewire
lumen

Disk

Purpose: Visualization on Fluoro, and allows for a predictable exit point
from the cath - " "



WINDOW: - right now is a cut-away leaving a lumen that looks like



- optimal length for the window is 3mm long (currently)
- optimal window location would be determined by the use of the device (i.e. in coronary would like to be w/in 20mm of distal tip, in peripheral --- ???)

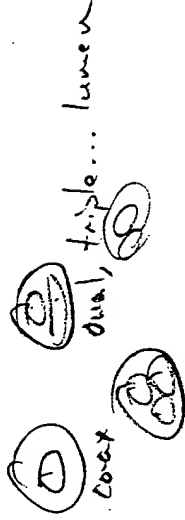
Puncture device / drug delivery tube:

- size ranges (from 0.0005 on up to 0.050")
- materials noted on other page

polymer } right now
or metal tube } polypropylene

current fit
~ 4F ~ .055"
(might want to be a bit smaller or bigger)

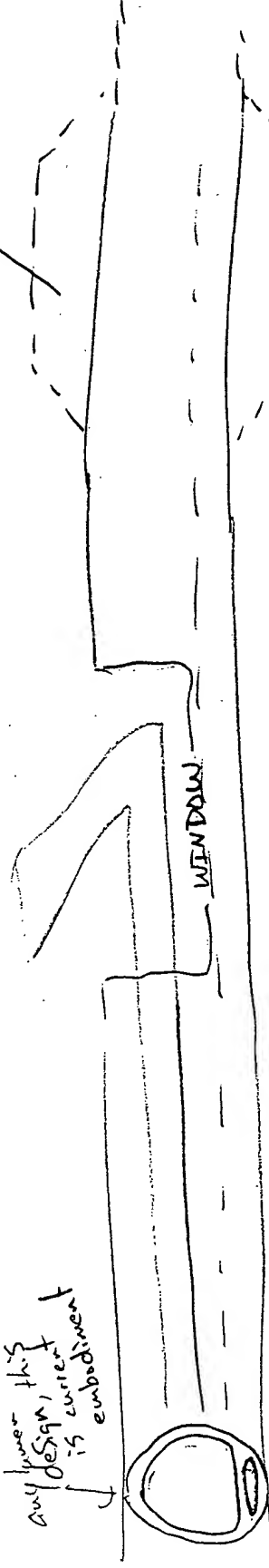
OUTER



- lumen for drug delivery
- lumen for guide wire
- could be a 3rd for a balloon...

possible balloon

any lumen, this design, this is current is embodiment



→ drug delivery tube goes in one of these lumens (free longitudinal motion)

- could be made of
- Polyimide tubing

- nitinol
- Polycarbonate

- balloon could be concentric, distal or eccentric + would

if there is a balloon, could be concentric, distal or eccentric + would

BF

- Maxifold for this device is the same as that which was used for the temp stat device.
(See prints # 03111-05,06)

- It is important to note that the hypodermic requires free longitudinal motion within it's lumen.

- Different models of this device would be sold w/ different lengths of needle (L) external to catheter.

- ID's + OD's of all of these tubes could be coated w/ teflon, HPC, extra coating.

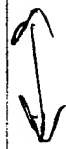
- Adhesives: - epoxy
- cyanoacrylates
- urethanes

Gus... take a look at other Sealed applications for commonly used adhesives.

Opening Gauge

Needle
tube
in
position
of
opening
gauge

Needle
tube
in
position
of
opening
gauge



Guidewire
Lumen

Purpose: indication of the degree to which the needle has opened and penetrated

BL
DUE
4/2/92

(Polymers for controlled release)

Poly lactide and

Poly glycolide

Poly ortho esters

Poly caprolactone

Cross-linked proteins

Allyl methacrylate

Agarose

Agar

Poly methyl methacrylate

Copolymers of the above and below

Gus: here's a start



VIA FEDERAL EXPRESS

June 30, 1992

Gustavo Siller, Jr., Esq.
Willian Brinks Olds Hofer
Gilson & Lione
NBC Tower
455 North Cityfront Plaza Drive
Suite 3600
Chicago, IL 60611-5599

APR 22 2002

Re: New Disclosure on Drug Delivery Concept

Dear Gus:

Attached is a disclosure package on a new extra vascular drug delivery concept. The inventor is Brad Linden.

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Sincerely,

SCIMED LIFE SYSTEMS, INC.

David A. VandenEinde
Patent Engineer
THE PTR GROUP

DAV/ps
Enclosures

Letter of Disclosure

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Abstract: This method involves the implantaion of a biodegradeable material in close proximity to the extravascular side of a coronary artery where the implant will remain and release its therapeutic agent over a period of time. This invention involves several specific points.

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APR 22 2002

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Inventor:

Donald F. Palmer II

Date: 3/18/92

Inventor:

Bruce C. Smith

Date: 3/18/92

Witness:
W. A. Smith
3/20/92

Interventional Therapeutics Program

Devices for site specific drug delivery

ADDENDUM TO DISCLOSURE: EXTRAVASCULAR DRUG DELIVERY

This document describes additional ideas with respect to disclosure made in March 1992 by Brad Linden.

Extravascular drug delivery can provide ideal pharmacologic circumstances for the delivery and uptake of drugs. This is due to the fact that intravascluarly delivered drugs are diluted and whisked away by the blood before they have time to act on their target(s). When a drug is delivered peri-adventitially, it has the opportunity to remain in the vicinity of its delivery for sustained periods of time which allows the drug time to diffuse into the vessel from the outside. The obvious question is: How do we do it?

There are two possible approaches:

1. Approach from the outside of the vessel.
2. Approach from the inside of the vessel.

Approach 1:

The vessel can be approached from the outside via a "self-guiding" catheter which may be introduced into the thorax through a sub-xiphoid ventral incision approach, or a lateral or dorsal incision through the intercostal (between the ribs) muscles, whichever would be most advantageous to reach the coronary vessel or region of choice. This procedure could be performed under fluoroscopy using a balloon catheter placed at the PTCA site as a marker.

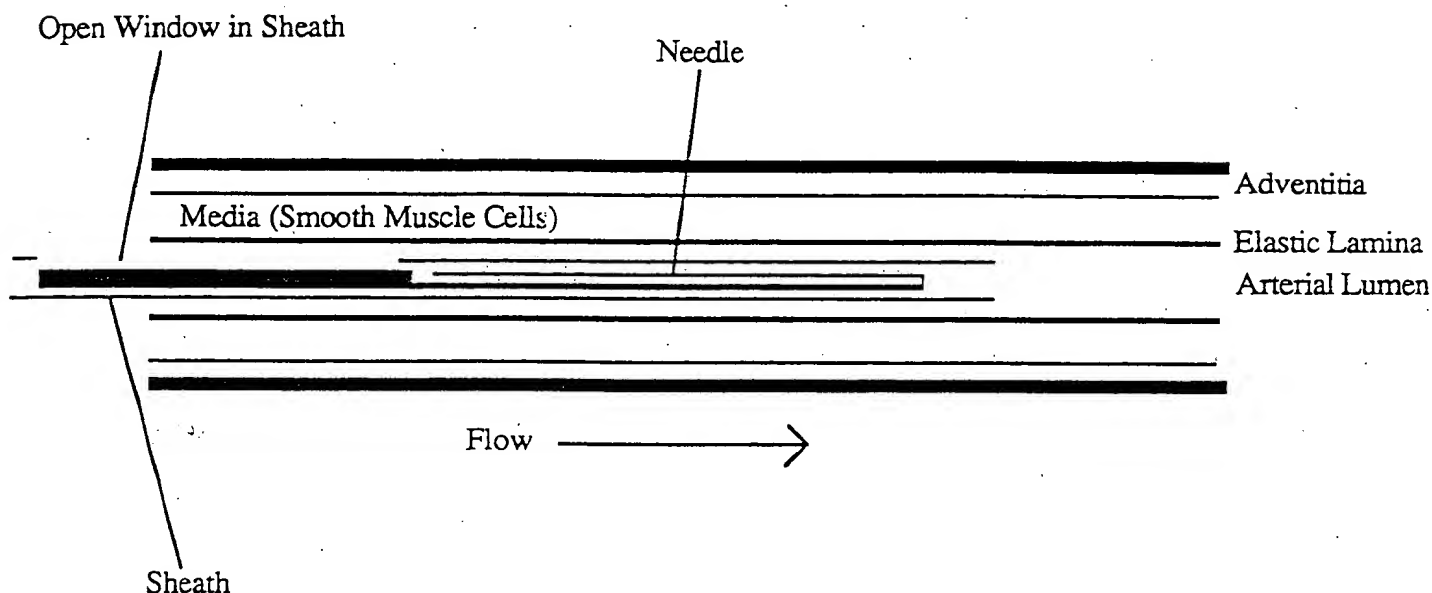
Approach 2:

The vessel can be approached from the inside and then gain access to the exterior of the vessel (intra-extravascular delivery).

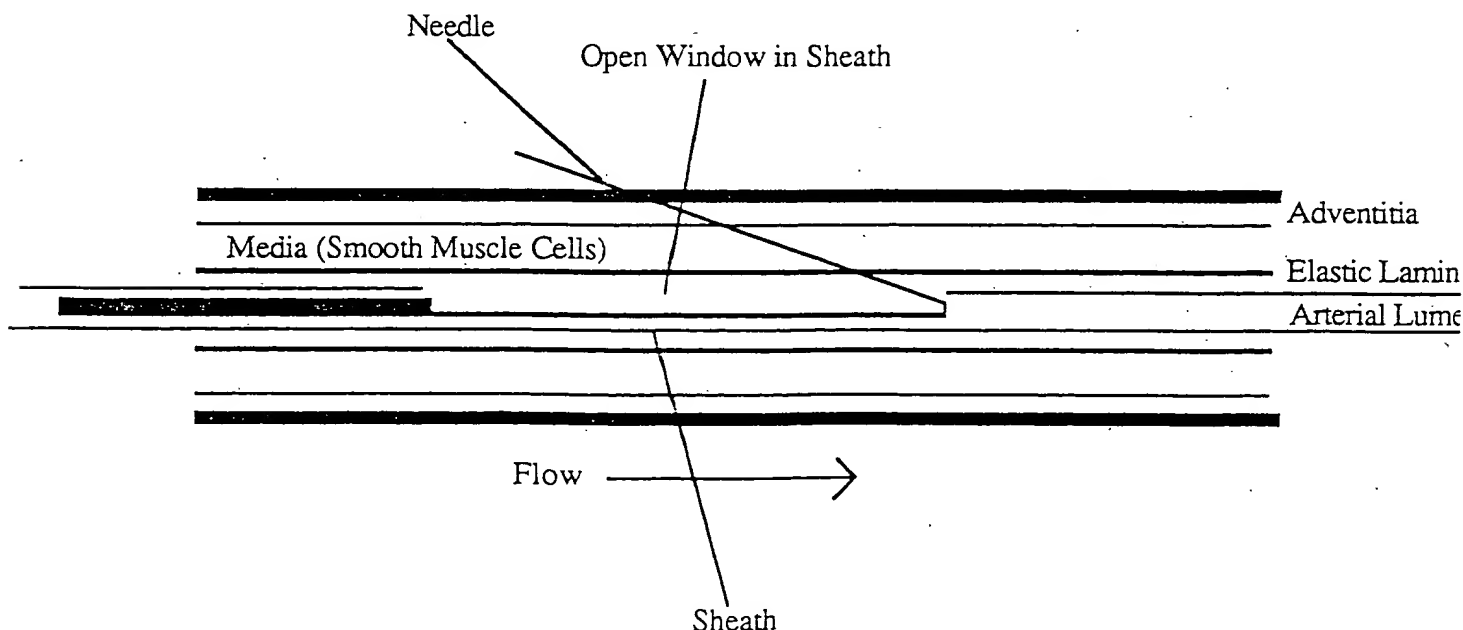
With the advent of some of the newer technologies it has become a relatively routine event to perforate an artery while performing one of these procedures. While this event is harrowing, it does not always spell CABG. I propose that an artery can be selectively and safely perforated with a small gauge needle, and that therapeutic agents can then be delivered to the peri-adventitial space. This can be achieved using a device as follows:

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Devices for site specific drug delivery



The device can be guided to a site under fluoroscopy using standard PTCA guiding catheter and guidewire techniques. The sheath can be advanced to place an open window over the radiopaque needle so the needle may be released and orient itself at an angle to the shaft with a certain degree of opening force. The catheter can then be pulled back to insert the needle into the vessel wall and exit on the adventitial side. Therapeutic agent can be infused over most any period of time because the device does not block flow. After the infusion is complete, the catheter can be pushed forward to remove the needle from the vessel wall, and the sheath can be pulled back to force the needle back into a position parallel to the catheter shaft.



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Devices for site specific drug delivery

The angled retrograde path of the needle protects the needle track from being filled with flowing blood and causing dissection, and allowing the track to clot closed.

Visualization can be aided by the use of various radiopaque parts.

Guidance of the needle can be monitored by incorporating intravascular ultrasound into the device to determine when the adventitia has been reached.

Other Therapeutic Uses:

This device could be used for the treatment of various disorders involving vessel-like lumens in the body, such as prostatitis, the delivery of cancer chemotherapeutics, and the site specific delivery of controlled release antibiotics for the treatment of pericarditis.

Inventor

Bradley C. Smith

Date

6/16/92

Witness

[Signature]

Date

6/16/92

Interventional Therapeutics Program

Devices for site specific drug delivery

**Addendum to Extravascular
Drug Delivery Disclosure**

Bradley C. Linden

6/28/92

The device can have needles of various:

1. Sizes - IDs from less than .001 inches and ODs from smaller than 36 gauge.
2. Lumen shapes - The lumen of the needle may not only be round, but other shapes which may effect the performance of the device. Therefore, the lumen may be:
 1. Oval
 2. Rhomboid
 3. Trapazoidal
 4. Triangular
 5. Round
 6. Rectangular
3. Needle shapes - The needle may have intricate shapes which enable the device perform optimally.
4. Cuts - The cut at the end of the needle can optimize performance of the device, patterns can be formed on the sharpened end of the needle to optimize is properties.

DEVICE DESIGNS:

Design1: The device can be comprised of:

1. A multiple lumen tube, one of which serves as a guidewire lumen which is in communication with a port on the manifold, and another (one or more) serves to house the "Delivery apparatus".

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Devices for site specific drug delivery

2. A manifold which is comprised of:
 - a. An external body having a port for the introduction of a guidewire which communicates with the guidewire lumen through the length of the device, and a "locking mechanism" which operates via a "cam" action to immobilize an "actuator".
 - b. A "Actuator" which is in communication with the "delivery apparatus" in such a way that a solution can be infused through a fitting part of the actuator, and that fluid can then flow through a lumen or lumens of the "delivery apparatus" exiting out the needle/s.
3. An inflatable balloon can be incorporated into the device to enable the controlled placement/penetration of the needle/s.
4. The position of the components of the device can be monitored under fluoroscopy with the aid of marker bands or other means to denote the position of the various components of the device with respect to one another and or other components used in the procedure.
5. The "delivery apparatus" can be comprised of:
 - a. A single needle or a multitude of needles
 - b. Needles composed of:
 - Spring steel
 - Stainless steel
 - Titanium
 - Nitenol
 - A polymer or copolymer
 - Any combination of the above
 - c. Hypotubes composed of:
 - Spring steel
 - Stainless steel
 - Titanium
 - Nitenol

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Devices for site specific drug delivery

A polymer or copolymer
Any combination of the above

6. A balloon can be part of the device, located either proximal to, distal to, or at to the needle section. This balloon can serve as a means for inducing haemostasis at the site of puncture, or it may be used for dilatation before, during, or after the drug delivery, or the balloon can be used to perform a PTCA or PTCA-like procedure.

7. The device can be coated with a material that will make it detectable (or more so) by intravascular ultrasound. The location of the components of the delivery apparatus can then be determined with respect to one another via the use of a separate intravascular ultrasound probe, or a probe which is a component of the device itself. This will allow the user to monitor the position of the needle as it enters its target site.

8. The device can be coated with a material that will enable or enhance its visualization by:

MRI
CT scan
X-Ray
Gamma camera imaging
PET scan

METHOD:

This device can be used to treat:

Pulmonary sites
Genitourinary sites
Cardiovascular sites
Gastrointestinal sites
Cerebral sites
Peritoneal sites
Ophthalmic sites

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Devices for site specific drug delivery

Pancreatic sites

Hepatic sites

Skeletal muscle, connective tissues, and bone sites

Nervous system sites

Thrombus

Plaque

Different regions of the vessel wall

Dissections

Vessel wall/body lumen or cavity abnormalities (ie aneurisms)

The device can be used to place drug impregnated polymer in various configurations (such as a rod) at a site.

The needle/s or a conductor can be heated or cooled to enhance the performance of the device.

The needle/s or a conductor can be made to vibrate at various frequencies to enhance the performance of the device (ie optimize drug delivery).

The delivery apparatus can have a means for the conduction, transfer, or passage of light energy which is, or is not an intimate part of the "needle" or any other part of the device.

The device can be used to deliver any wavelength of light to a specific portion of the lumen or body cavity of choice.

The device can be used to deliver any wavelength of light to a specific portion of the vessel wall.

The device can be used to deliver any wavelength of light to a specific portion of the adventitia.

The device can be used to deliver and activate light activated drugs.

The device can be used to deliver and activate heat/cold activated drugs.

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The device can be used to deliver and activate sonically activated drugs.

The device can be used to deliver a substance which will carry the energy of light through wavelength and/or energy transitions.

The device can be used to deliver a substance which will carry energy through wavelength and/or energy transitions.

The device can be used to deliver and activate electrically activated drugs.

The device can have selectively or non-selectively magnetized elements.

The device can be used to induce an electric charge in an area.

The device can be used to induce a magnetic field in an area.

The device can be used to deliver perfluorocarbon (or any oxygen carrying compound) compounds for the treatment of cardiac or non-cardiac ischemia.

The device can deliver a matrix to the exterior of a body lumen or cavity to structurally reinforce the area, drug can be impregnated in this matrix and delivered coincidently.

The device can be used to deliver a material that can be hardened in the wall or on the adventitial side to be used as an extravascular stent.

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The device can be used to remove things or substances.

A vacuum can be placed in the delivery apparatus (microsuction).

Bradley C. Kurl

6/30/92

less: David A. V. B. J.

6/30/92

Letter of Disclosure

Invention: A method for the site specific extravascular controlled release of therapeutic agents for the treatment of restenosis, thrombosis, and/or cardiovascular disease.

Abstract: This method involves the implantaion of a biodegradeable material in close proximity to the extravascular side of a coronary artery where the implant will remain and release its therapeutic agent over a period of time. This invention involves several specific points.

1. The controlled release device:

- A. The device can be a polymeric rod or spike loaded with drug, which can be implanted next to an area on the heart which is to be treated.
- B. The device can be an injection of microcapsules loaded with drug, which can be placed in close proximity to the area of interest on the heart.
- C. The device can be an emulsion of liposomes loaded with drug, which can be placed in close proximity to the area of interest.

2. The delivery system:

- A. The controlled release device can be delivered via a catheter based system.
- B. The drug delivery system can be delivered surgically.
- C. The drug delivery system can be delivered via a non-catheter based injection system.

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3. The therapeutic agent:

A. The drug can be a, or any combination of:

- A.1. A Thrombolytic
- A.2. An Anti-thrombotic
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- A.4. An Anti-platelet
- A.5. A Protein
- A.6. A Peptide
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Inventor:

Donald F. Pabre II

Date: 3/18/92

Inventor:

Bradley C. Finch

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Witness:
Robert A. Smith
3/20/92

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Date: 3/18/92

Inventor: Bradley C. Smith

Date: 3/18/92

Witness: W. A. Smith
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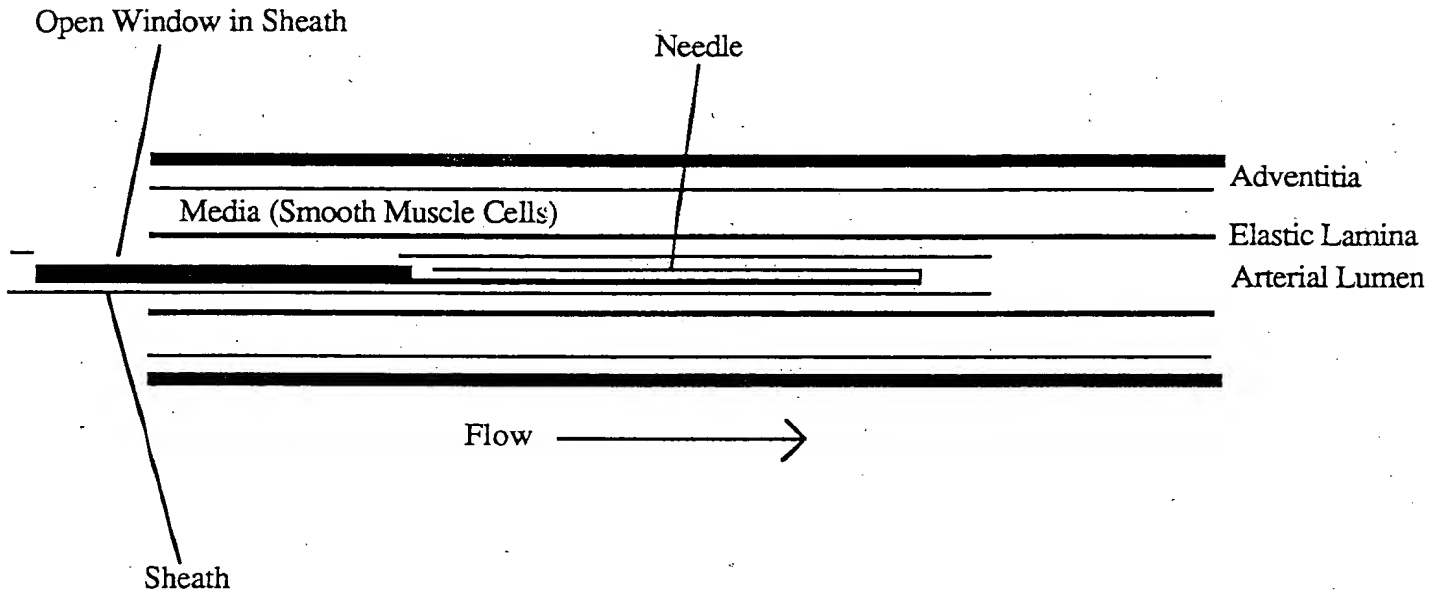
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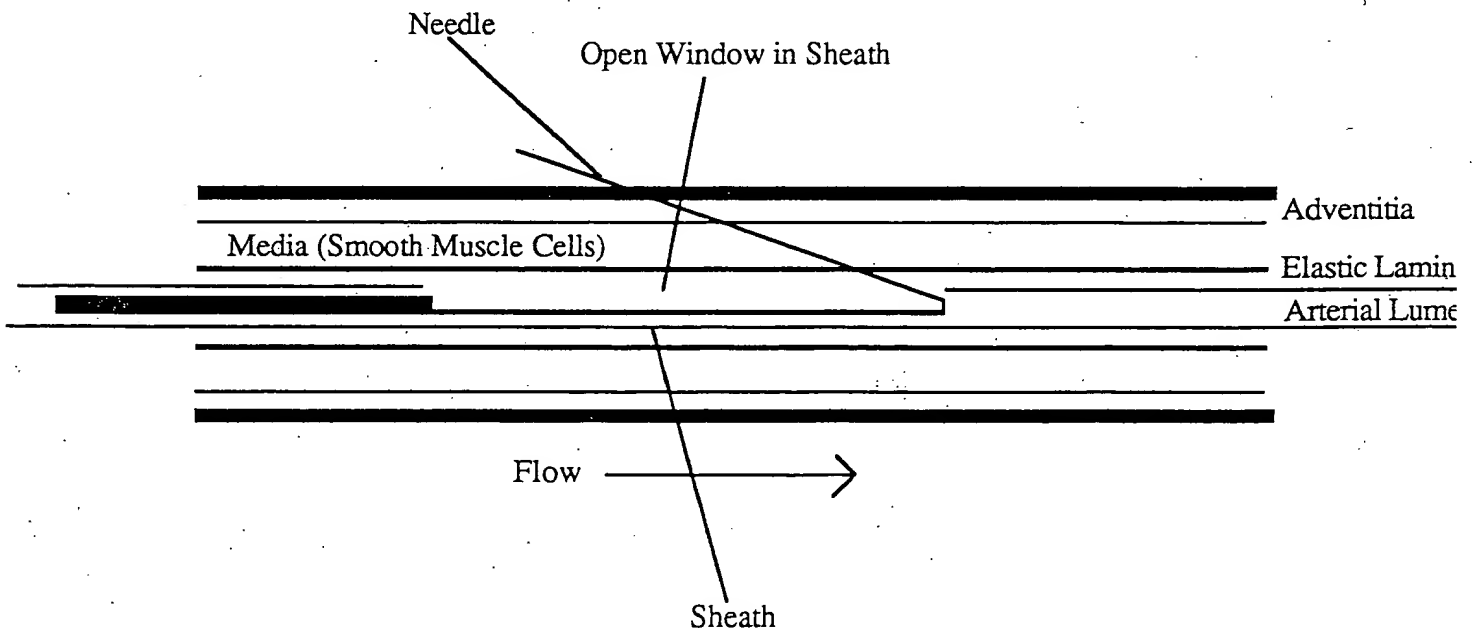
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Inventor

Bradley C. Smith

Date

6/16/92

Witness

[Signature]

Date

6/16/92

Country Applications

01-Jul-98

Case Number:	SM-P0080	Country:	US	SubCase:	01
Division:	SCIMED CARDIO - NEW MODALITIES		United States of America		
Case Type:	ORD	Application Status:	Pending		
Application Number:	07/913,227	Filing Date:	14-Jul-1992		
Patent Number:		Issue Date:			
Publication Number:		Publication Date:			
Tax Schedule:	LE	Expiration Date:			
Agent:	WBH	Agent Reference Number:	3570/216		
WILLIAN BRINKS HOFER					

Case Number: SM-P0080 US 01

Action(s) Due	Due Date	Indicator	Action Taken	Response Sent
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Remarks:

UserID:	diane	Date Created:	7/23/96	Last Update:	7/23/96
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